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Fish Population Data from Split and Stephens lakes, 1988

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ABSTRACT

T... ish populations of Split and Stephens lakes were sampled in the summer of 1988. The collected data are summarized in this report, with special emphasis on the relative abundance of each species and the effects of various mesh sizes on fish species. Growth rates, age compositions, maturity, survival and mortality rates of whitefish (Coregonus clupeaformis), walleye (Stizostedion vitreum vitreum), sauger (Stizostedion canadense) and northern pike (Esox lucius) are also described, in order to provide a data base for future management purposes.

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INTRODUCTION

The data presented in this report were collected in the summer of 1988 as part of the Ecological Monitoring Project. The purpose of the Ecological Monitoring Project is to ascertain and to evaluate current impacts and long term effects on existing and planned hydroelecric developments in northern Manitoba on abiotic and biotic environments in affected lakes and watercourses. The specific purpose is to address concerns expressed under Claim #18 of the Northern Flood Agreement. This report is of a preliminary nature, confined only to the description of fish populations in Split and Stephens lakes.

The main objectives of this report are:

1) to list the fish species caught, along with their relative abundance and catches per unit of effort,
2) to compare the effects of various mesh sizes on the number and total weight of each species caught and,
3) to describe age-composition, length-frequency distributions, maturity, growth and mortality regimes of whitefish, walleye, sauger and northern pike.

The function of this report is to provide baseline data on the fish populations of these lakes, therefore interpretation and discussion of the results is not included.

METHODS

Experimental Netting

All lakes were fished with a standard gang of gillnets. Each gang was composed of six gilnets with the following mesh sizes: 3.8 cm (1.5 in.), 5.1 cm (2 in.), 7.6 cm (3 in.), 9.5 cm (3.75 in.), 10.8 cm (4.25 in.) and 12.7 cm (5 in). Each net in the gang was 22.9 m (25 yd.) long and 1.8 m (5 ft.) deep. Gillnets were set overnight for a 16-20 h duration.

Fork length and round weight were recorded for all fish caught. Sex and state of maturity were recorded for the principal commercial species, whitefish, walleye, sauger and northern pike. For age determination otoliths were taken from whitefish, walleye and sauger. Cleithra were taken from northern pike. Otoliths were prepared and aged according to procedures described by Erickson (1979). Cleithra were cleaned of flesh and aged using an illuminated magnifying glass.

Calculations

Routine statistical analyses were performed according to Snedecor and Cochran (1967). Maturity, mortality and growth analyses were performed as described by Hagenson (1987). The presentation format of some figures and tables may have changed slightly.

RESULTS

Standard gang netting locations in Split and Stephens lakes are identified in Figs. 2-4 and 6-8. The catches of all species in each standard gang are enumerated in Tables 1 and 2. Average catches per standard gang and the relative abundance of each species are compared in Table 3. The number and total weight of each species caught in nets of different mesh sizes are listed in Table 4 and 5.

Further analyses are performed for whitefish, cisco, walleye, sauger, and norther pike. These analyses include:

1) the effects of different mesh sizes on the catch per unit of effort, mean length, mean weight, percentage of mature fish, mean age and age-% frequency (Tables 6-19),
2) age-specific size and maturity conditions for males, females and both sexes combined (Tables 20-28),
3) length-weight regressions (Table 29),
4) age-% frequency distribution for both sexes combined (Figs. 9-13), and length-frequency distributions (Figs. 14-21).
5) maturity regimes for males, females and both sexes combined (Table 30), and mortality-survival rates for both sexes combined (Table 31), and

6) derivation of von Bertalanffy's growth curves for both sexes combined (Table 32 and 33 and Figs. 23-26).

7) power curve length-age relationship (Table 34 and Figs. 23-26.

ACKNOWLEDGEMENTS

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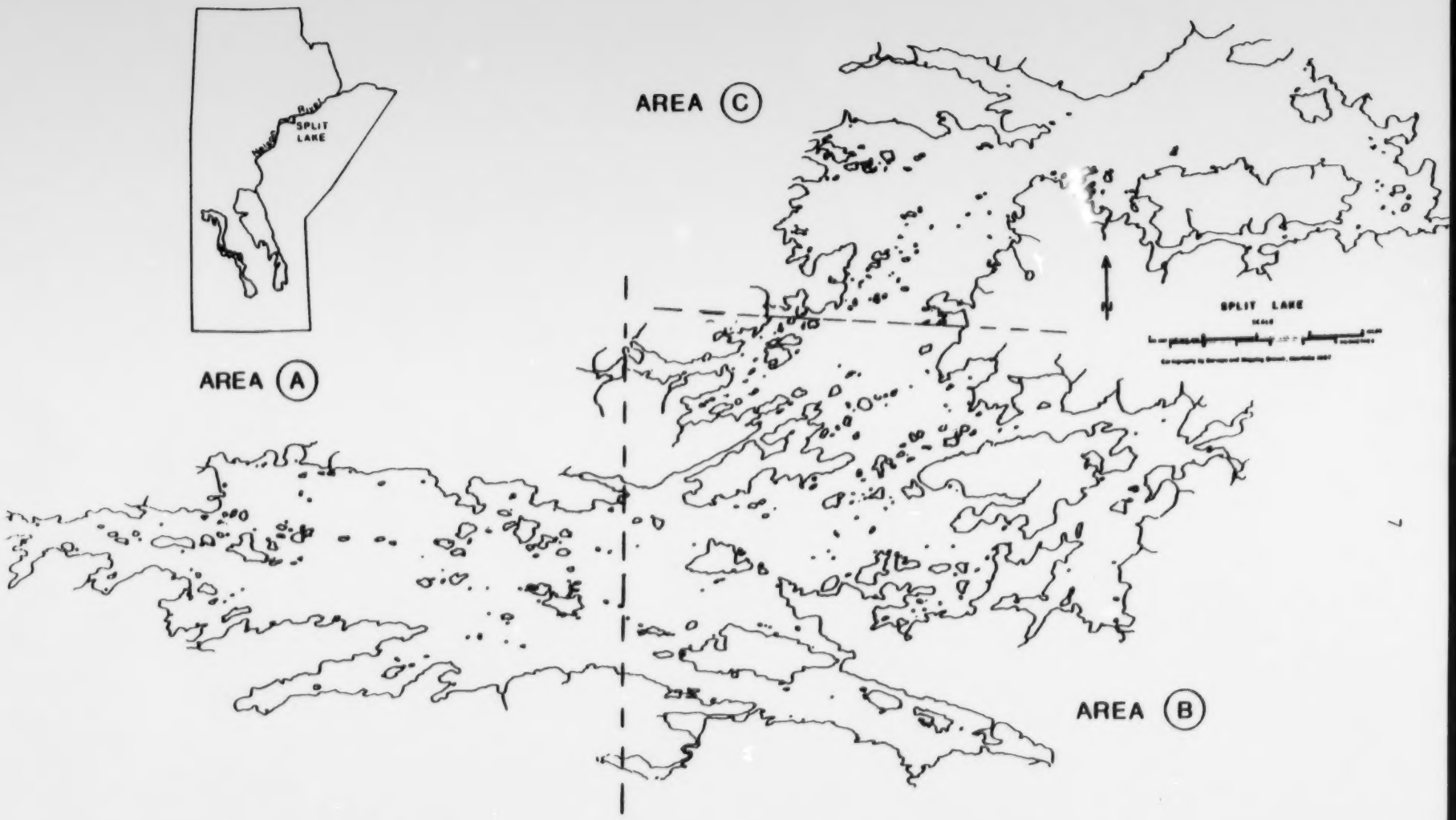

Fig. 1. Map of Split Lake showing large scale area boundaries.

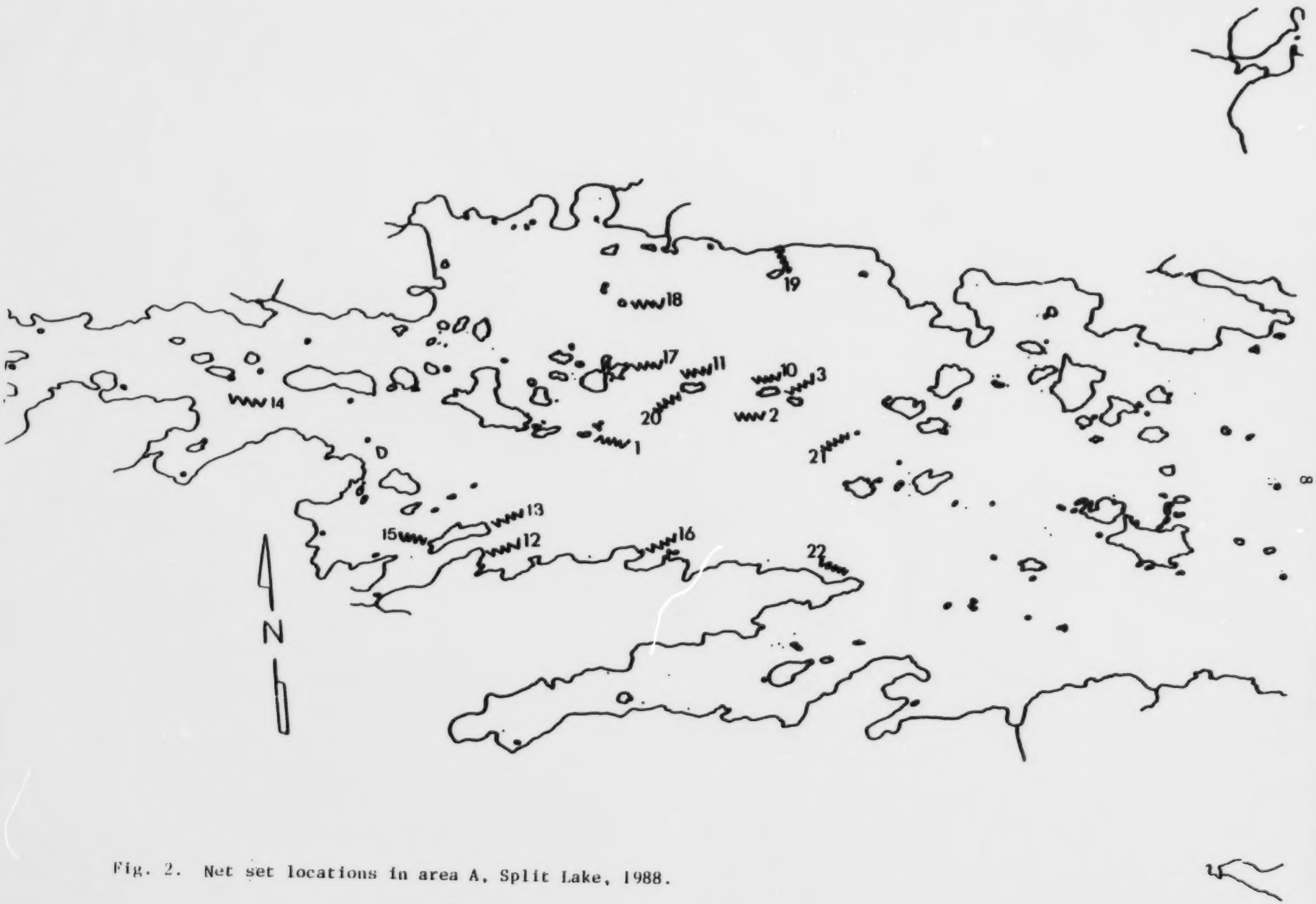

Fig. 2. Net set locations in area A, Split Lake, 1988.

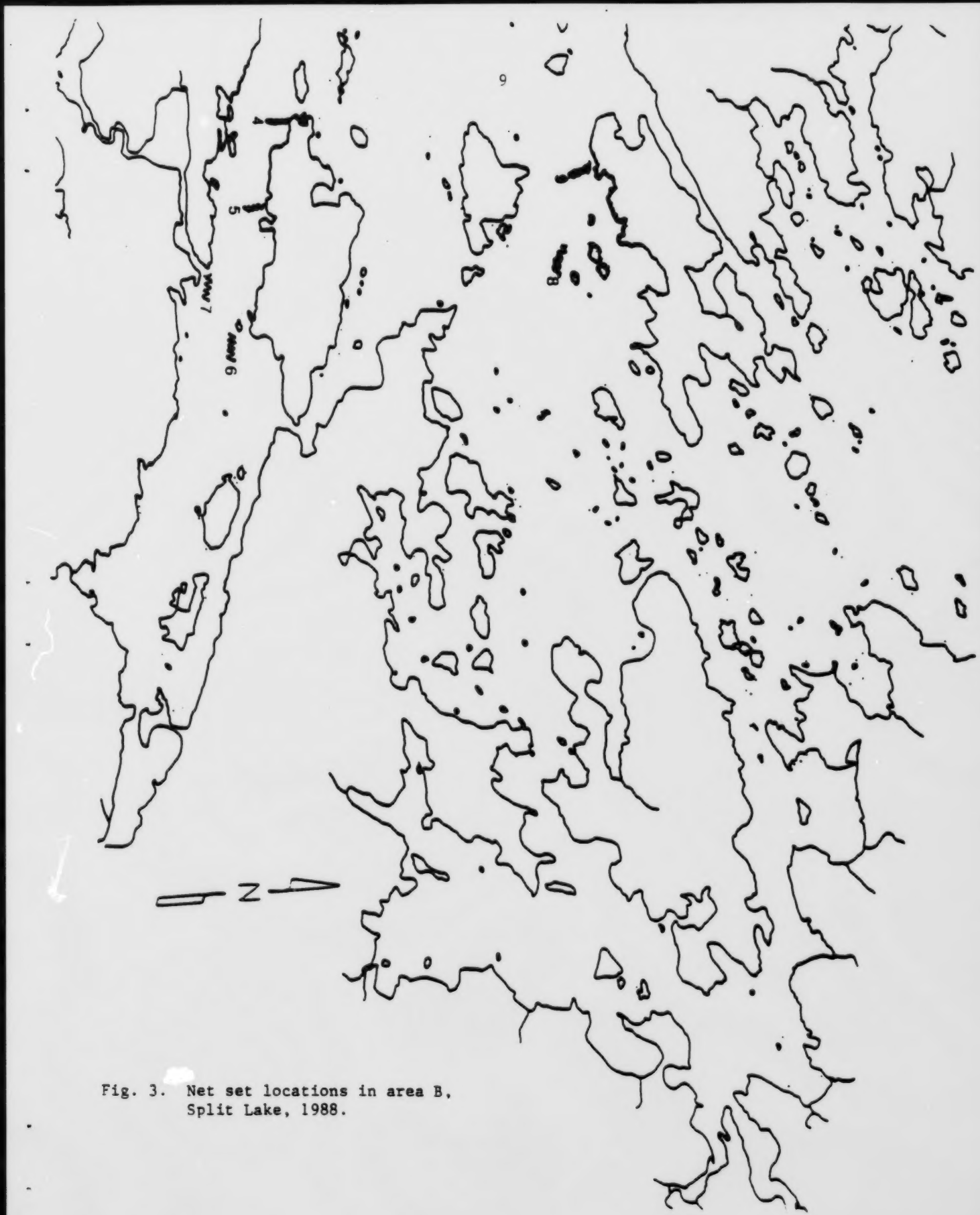

Fig. 3. Net set locations in area B, Split Lake, 1988.

Fig. 4. Net set locations in area C, Split Lake, 1988. Note no net sets were made in this area in 1988.

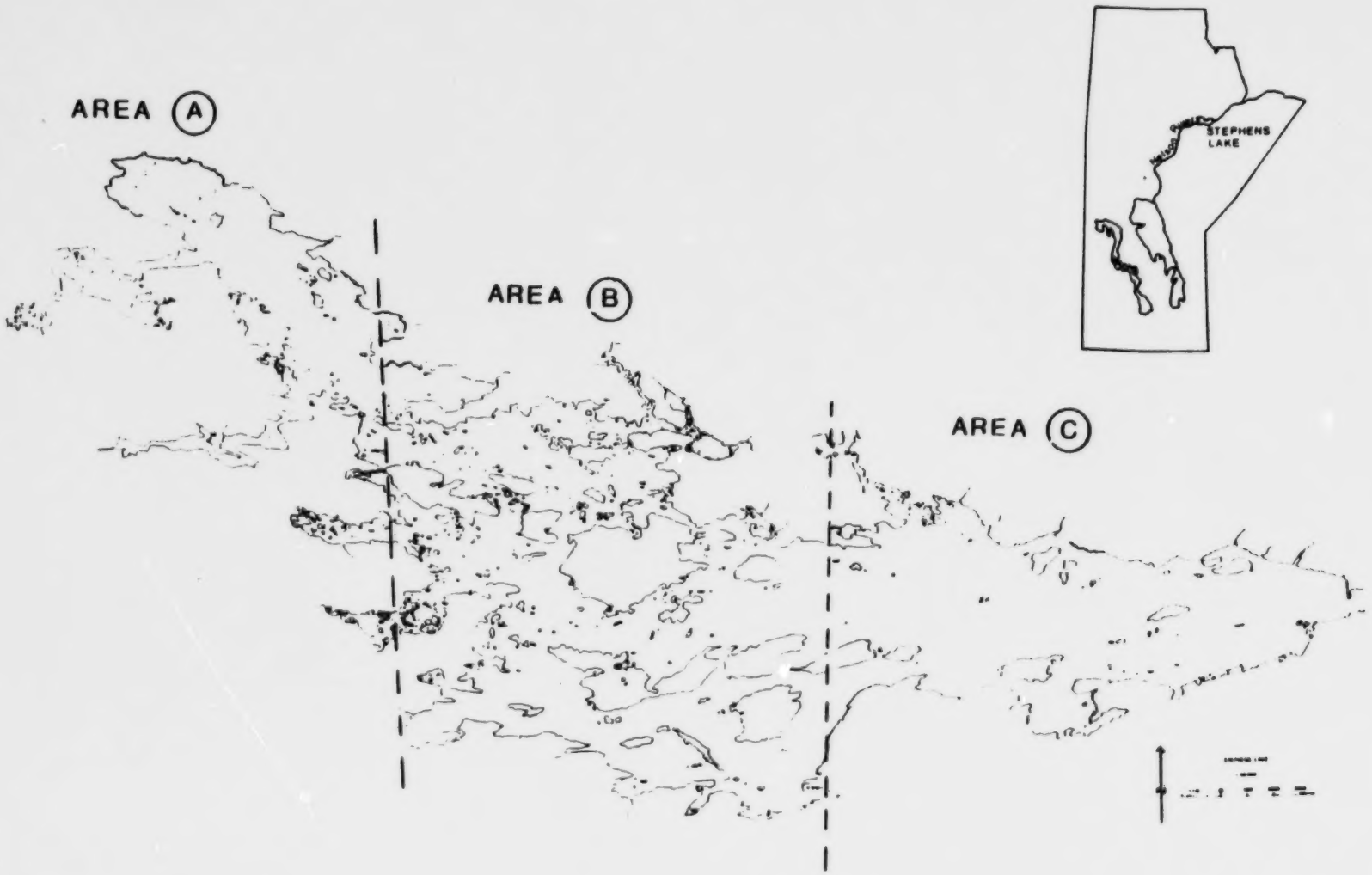

Fig. 5. Map of Stephens Lake showing large scale area boundaries.

Fig. 6. Net set locations in area A, Stephens Lake, 1988.

Fig. 7. Net set locations in area B, Stephens Lake, 1988.

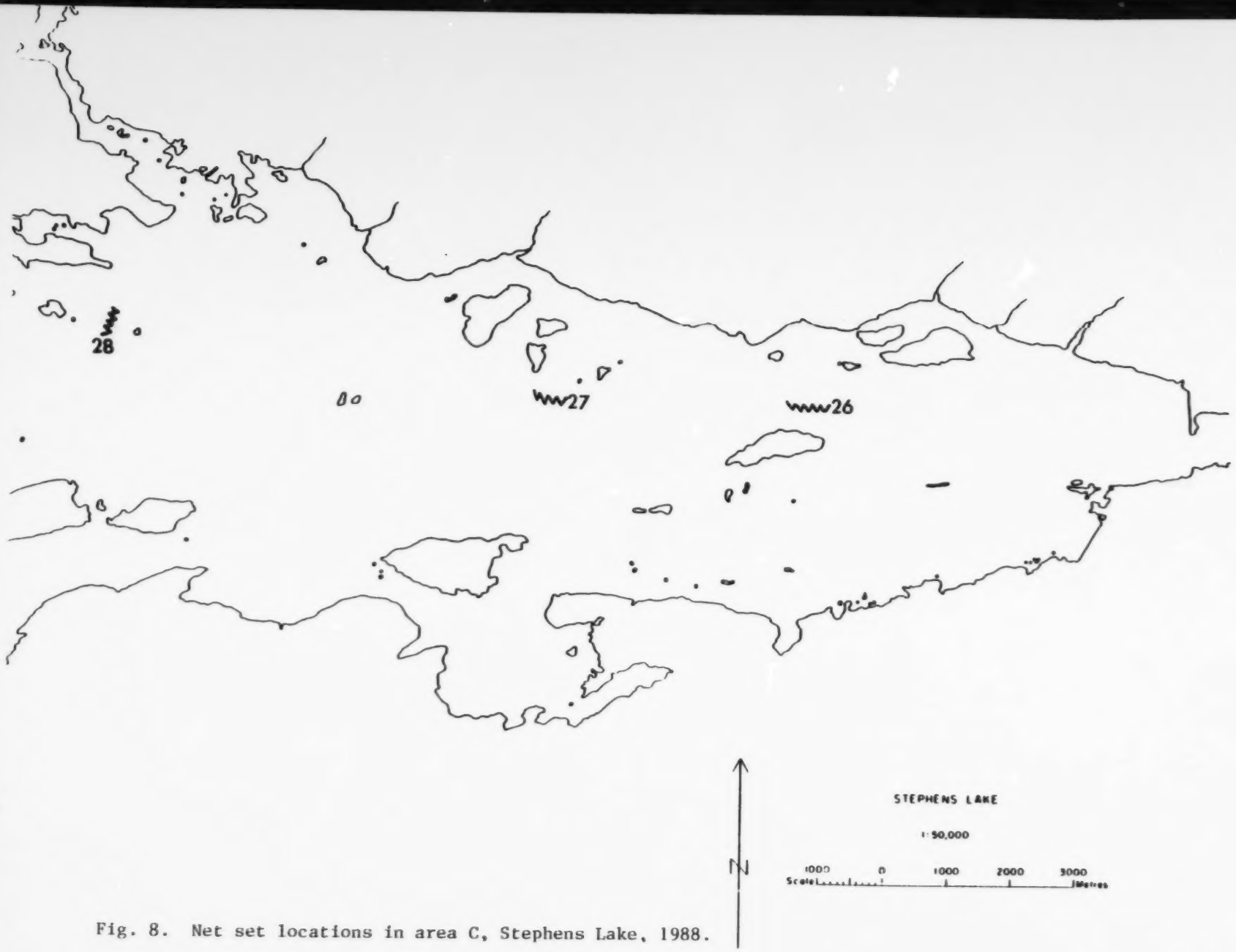

Fig. 8. Net set locations in area C, Stephens Lake, 1988.

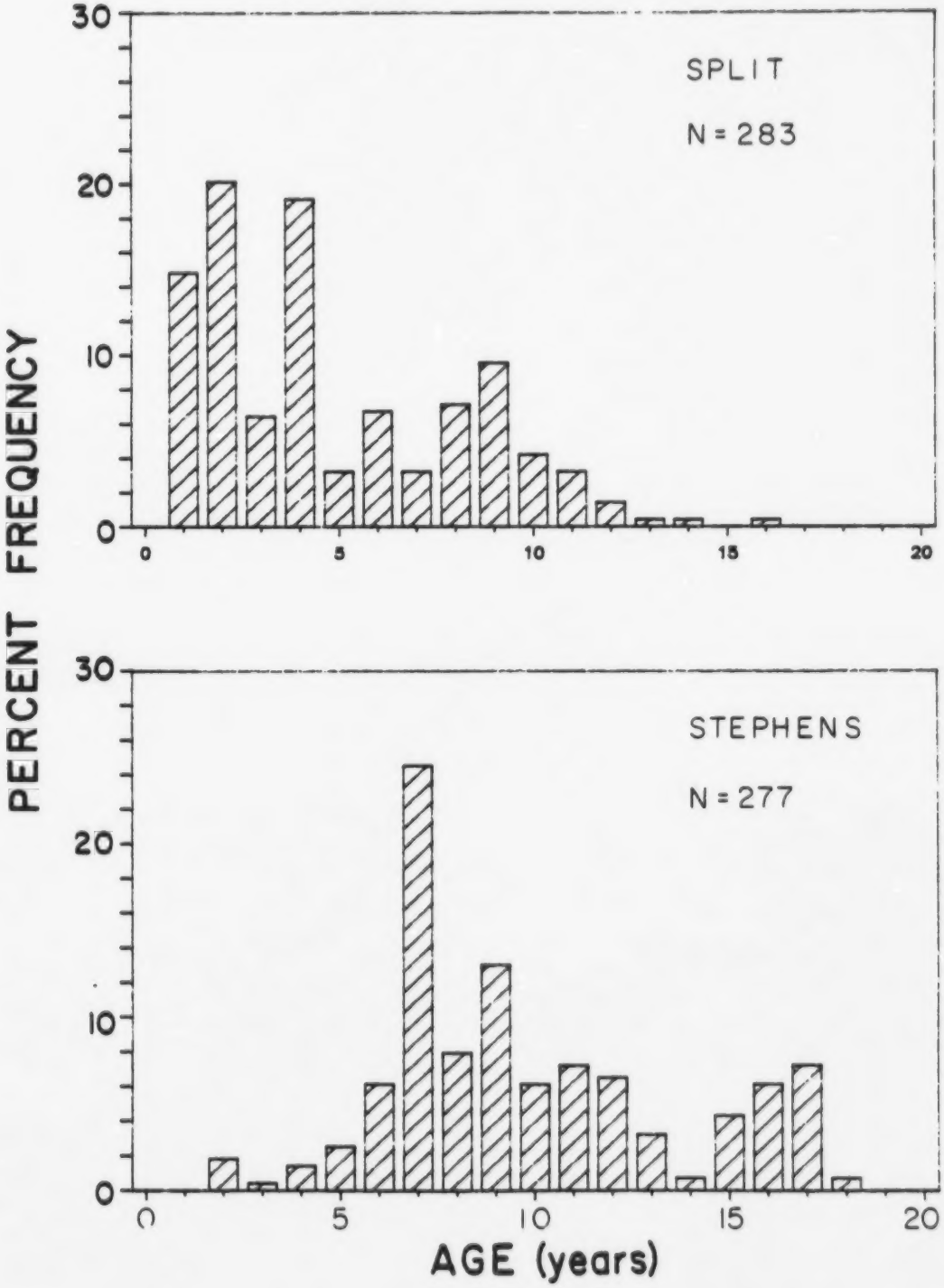

Fig. 9. Age compositions of whitefish from Split and Stephens lakes, 1988.

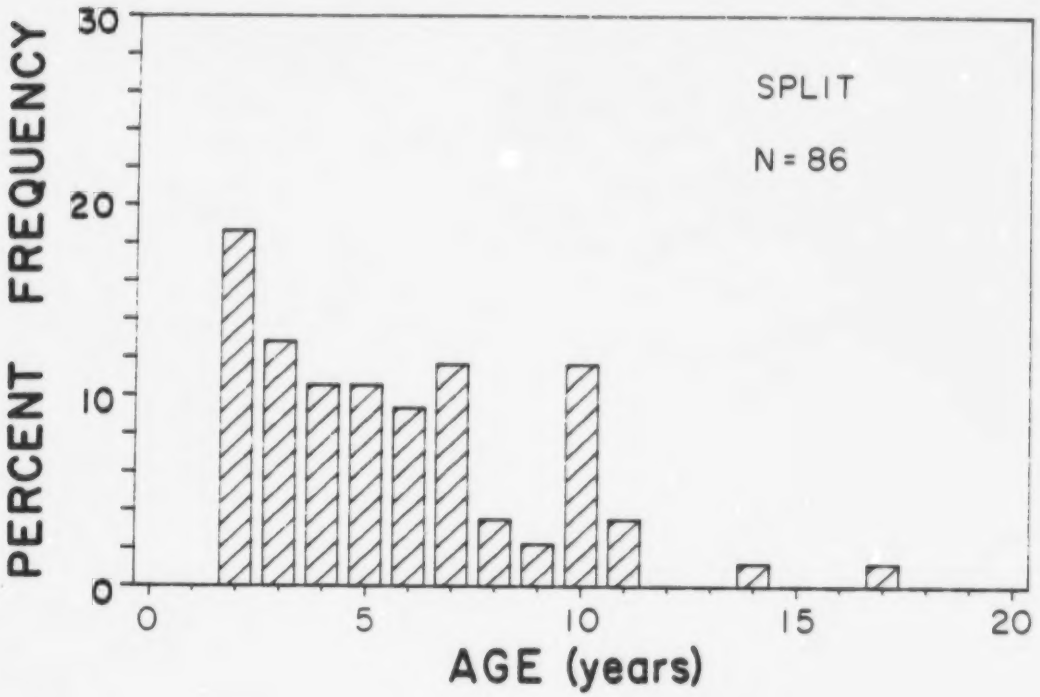

Fig. 10. Age compositions of cisco from Split Lake, 1988.

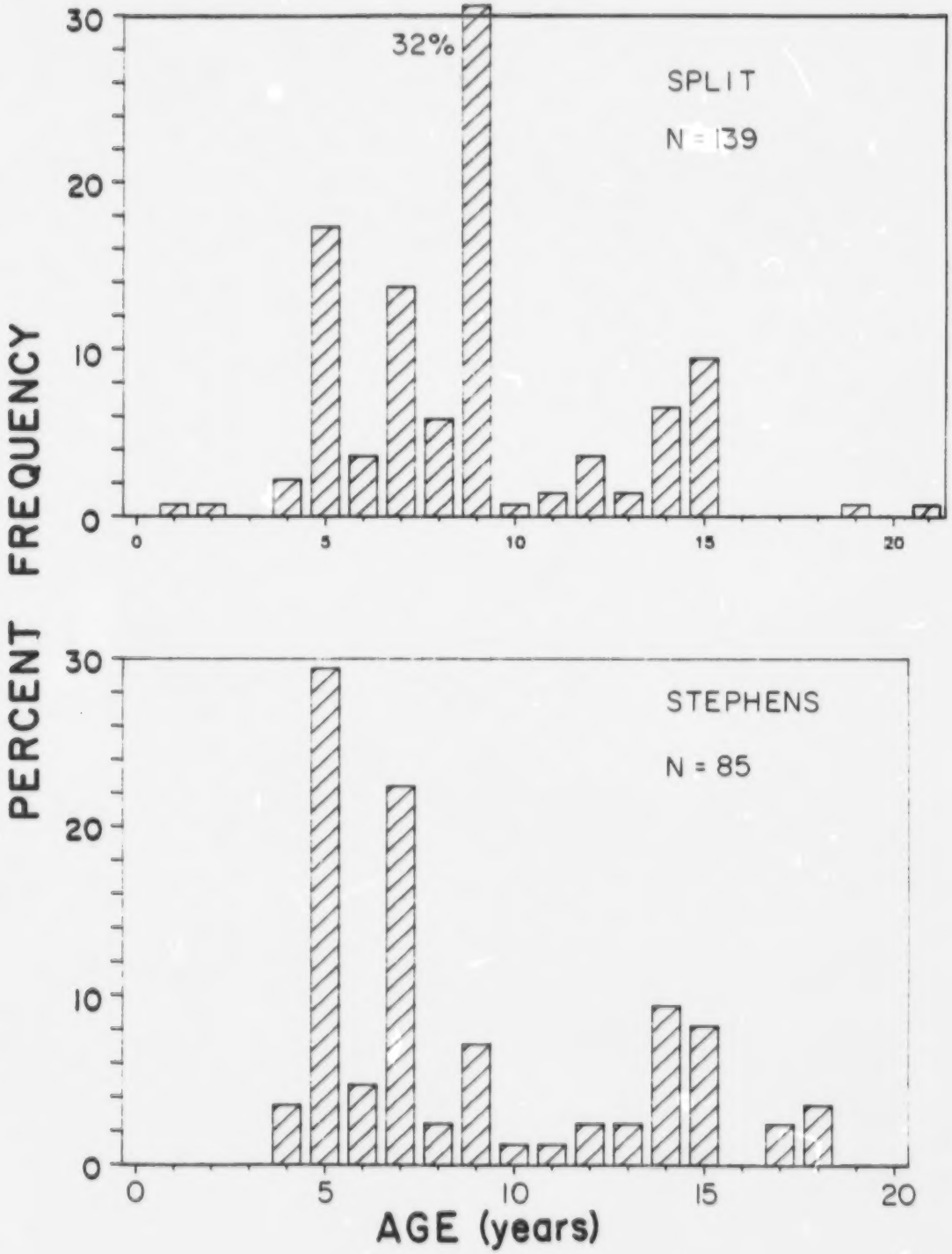

Fig. 11. Age compositions of walleye from Split and Stephens lakes, 1988.

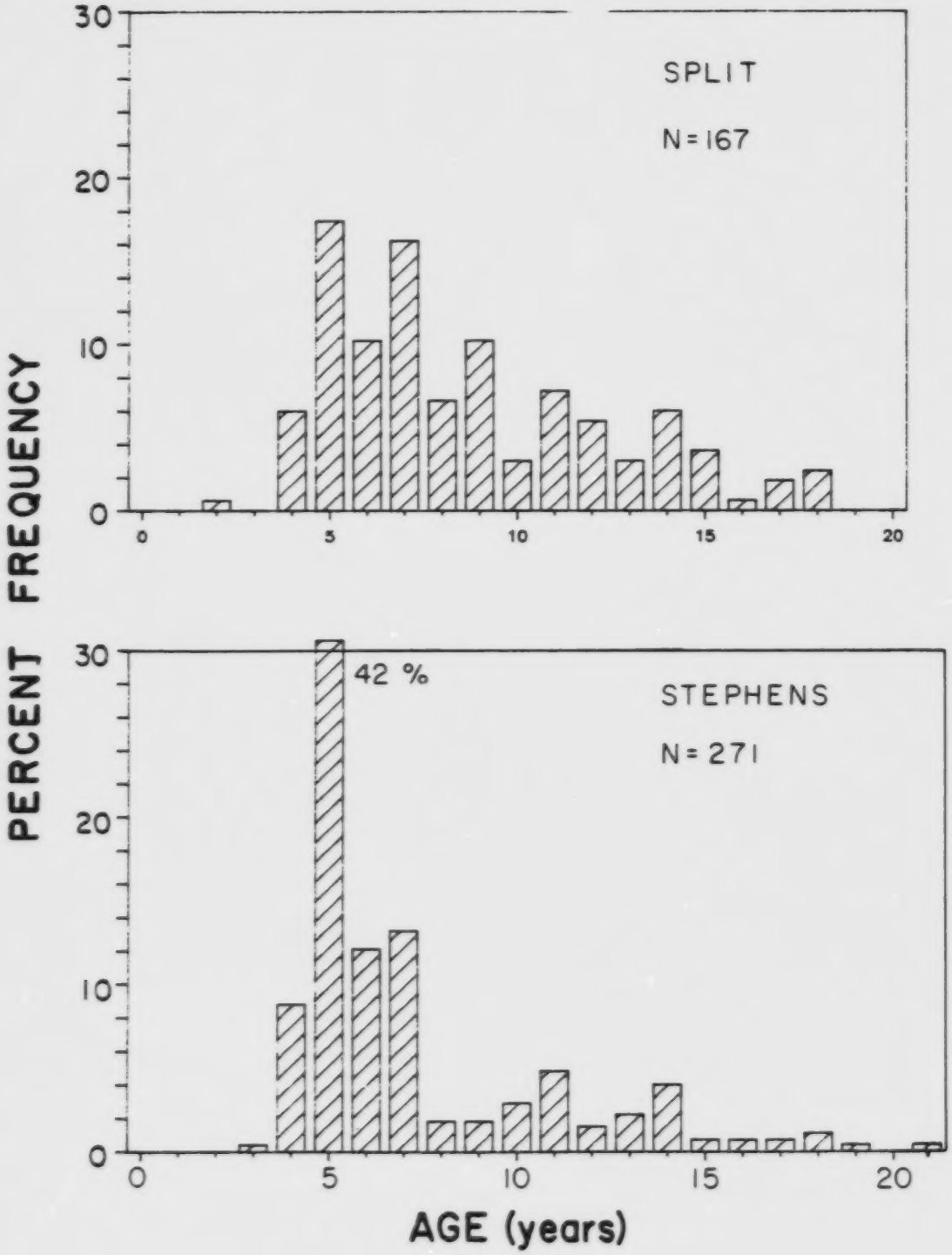

Fig. 12. Age compositions of sauger from Split and Stephens lakes, 1988.

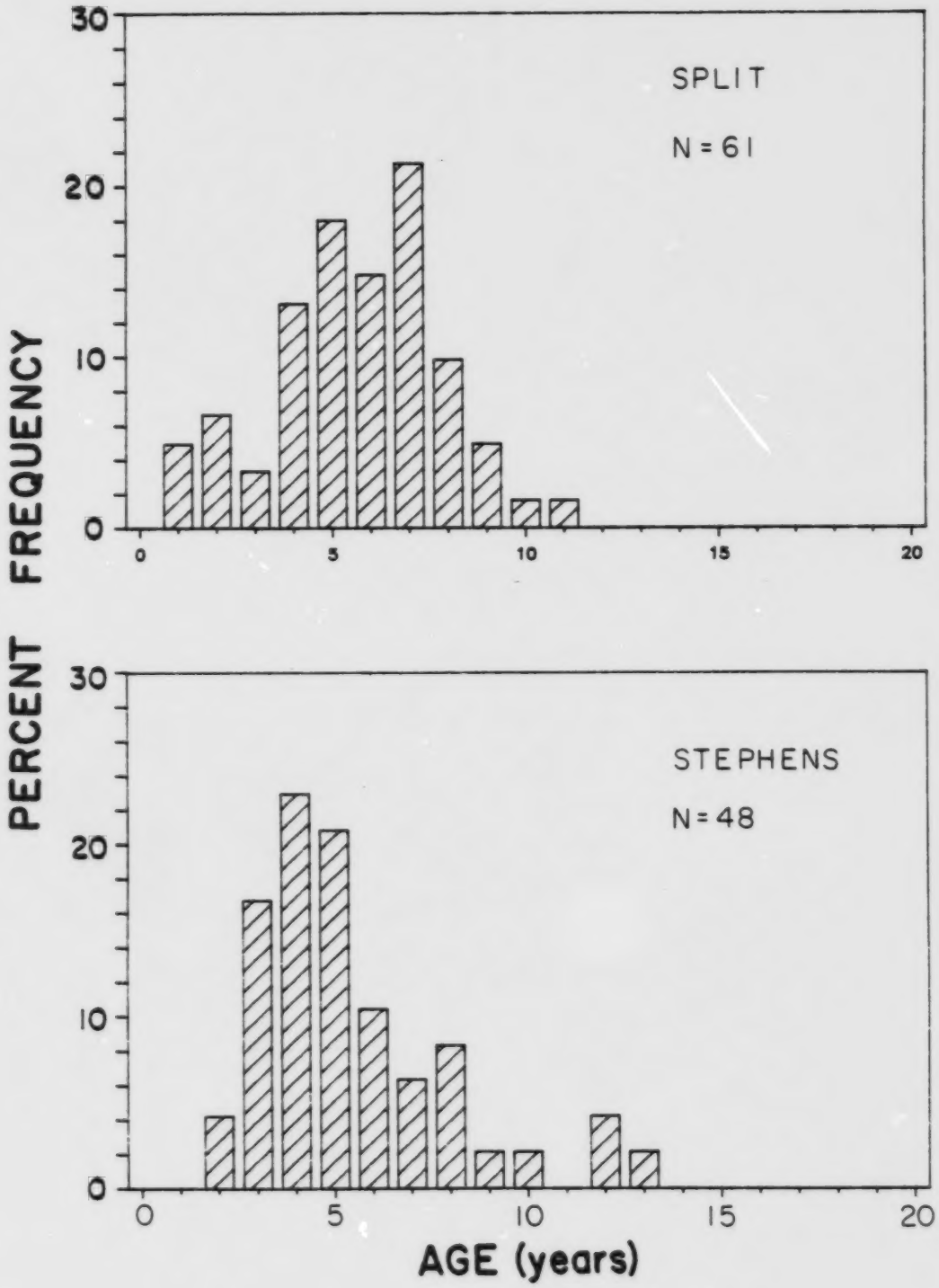

Fig. 13. Age compositions of northern pike from Split and Stephens lakes, 1988.

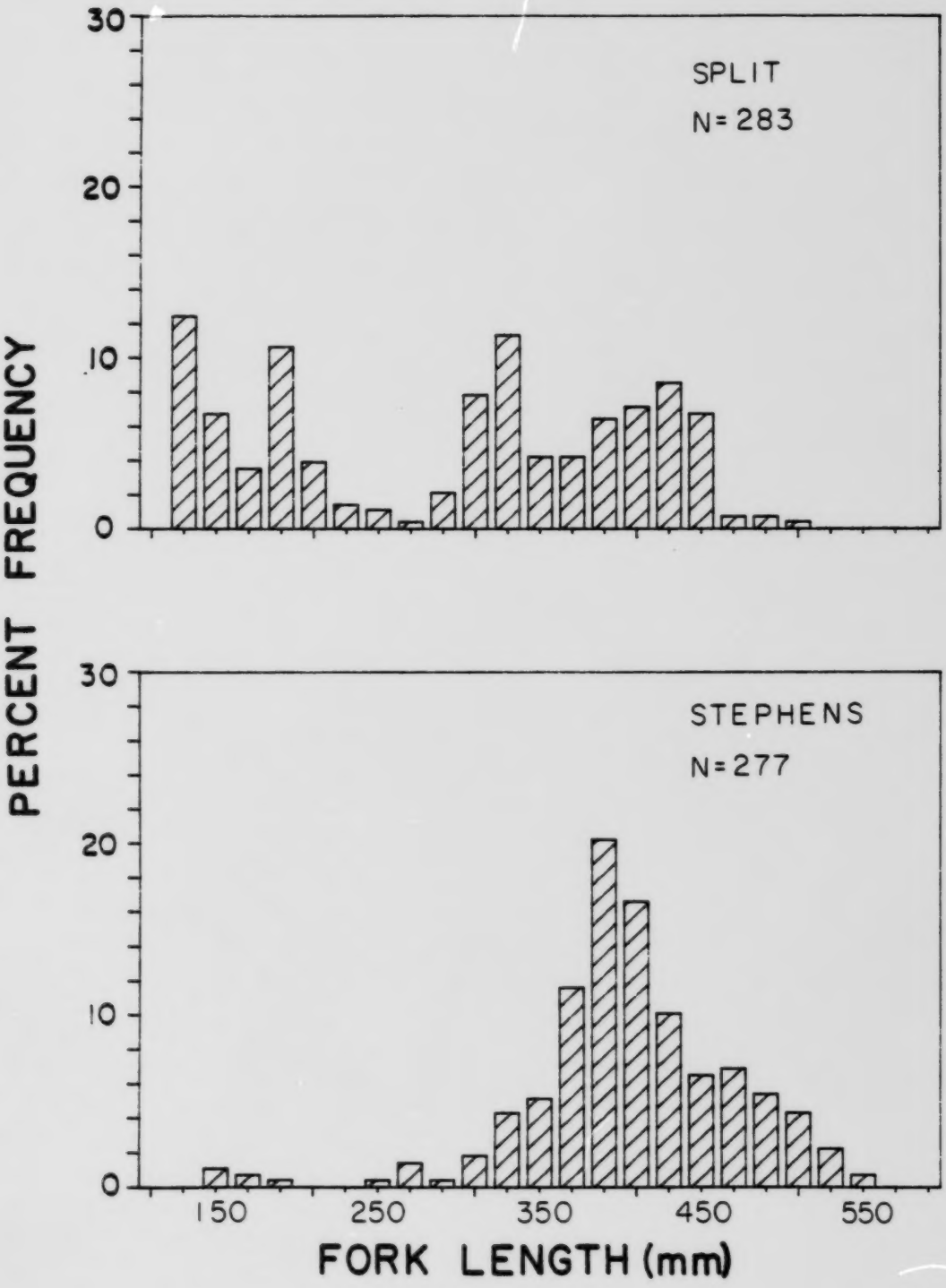

Fig. 14. Length-frequency distribution for whitefish from Split and Stephens lakes, 1988.

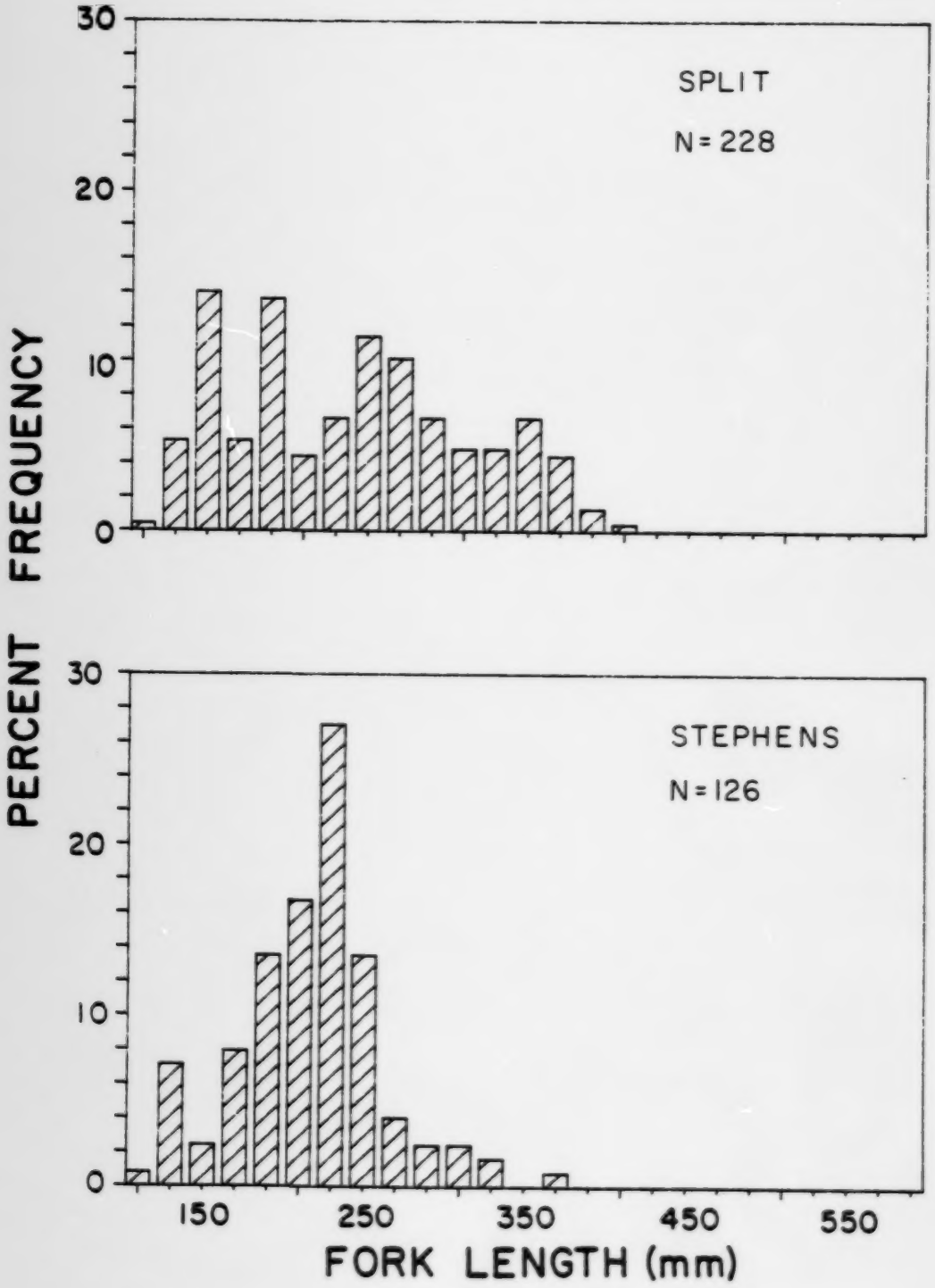

Fig. 15. Length-frequency distribution for cisco from Split and Stephens lakes, 1988.

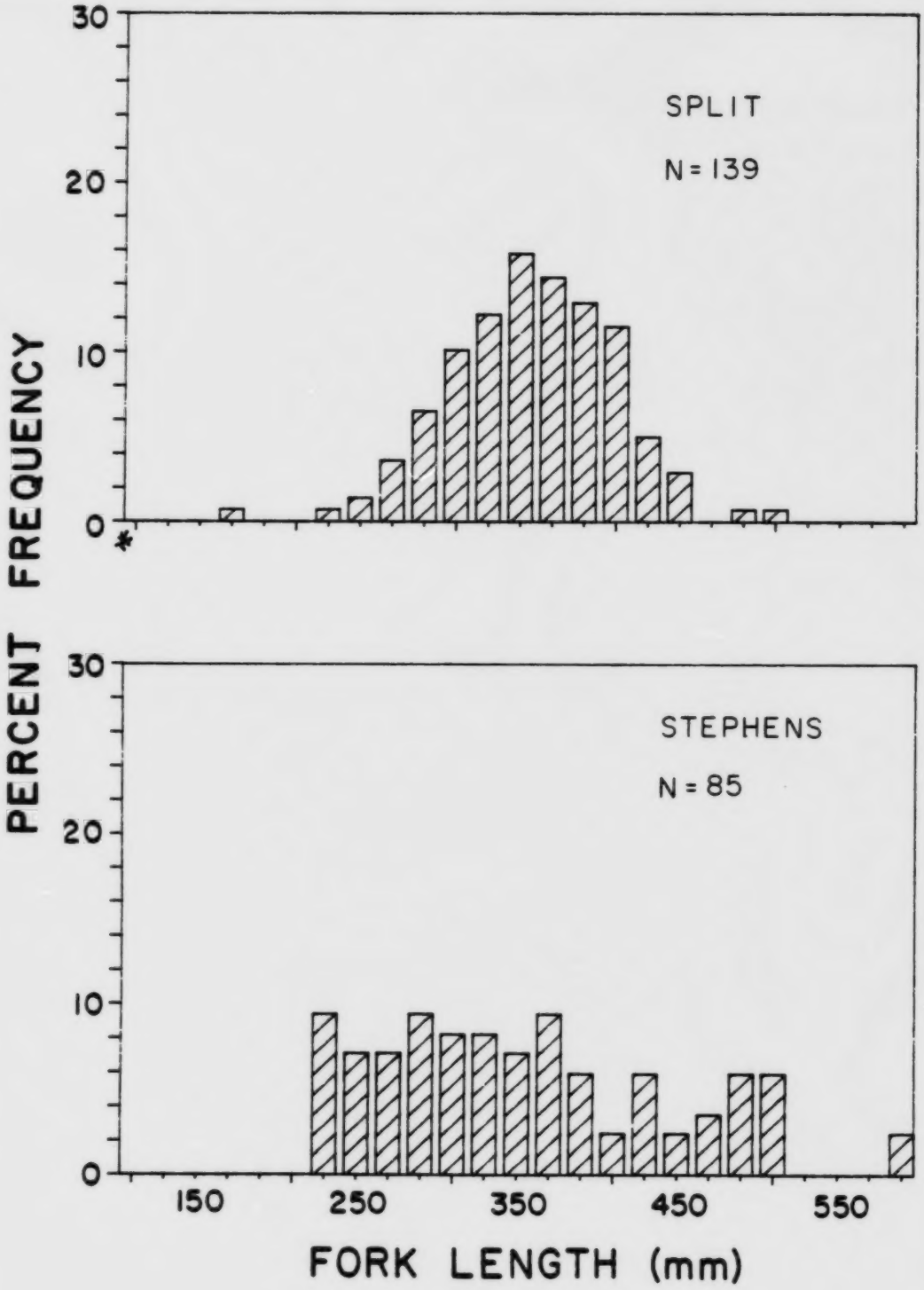

Fig. 16. Length-frequency distribution for walleye from Split and Stephens lakes, 1988.
* Split 80-99.9 = 0.7%.

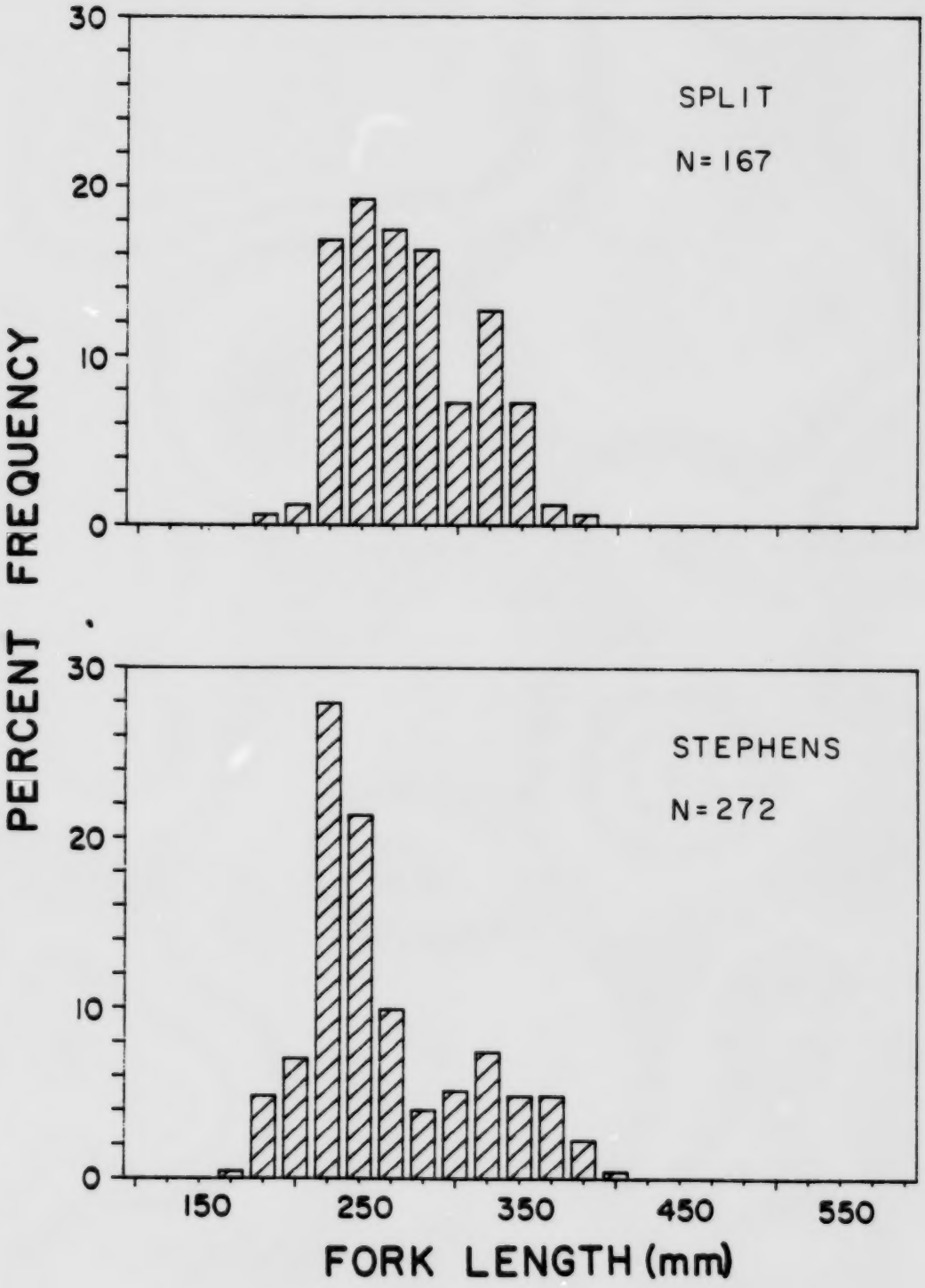

Fig. 17. Length-frequency distribution for sauger from Split and Stephens lakes, 1988.

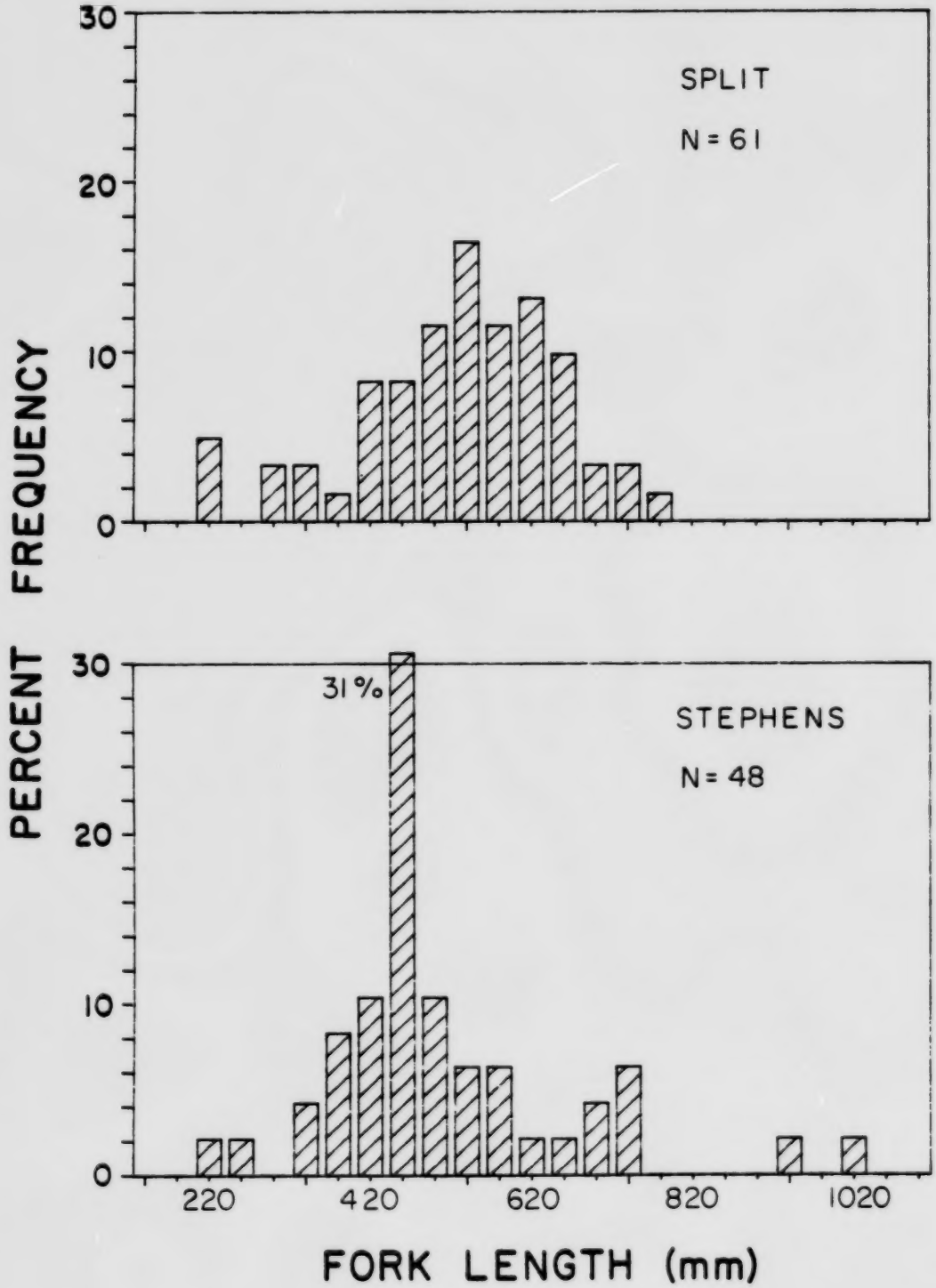

Fig. 18. Length-frequency distribution for northern pike from Split and Stephens lakes, 1988.

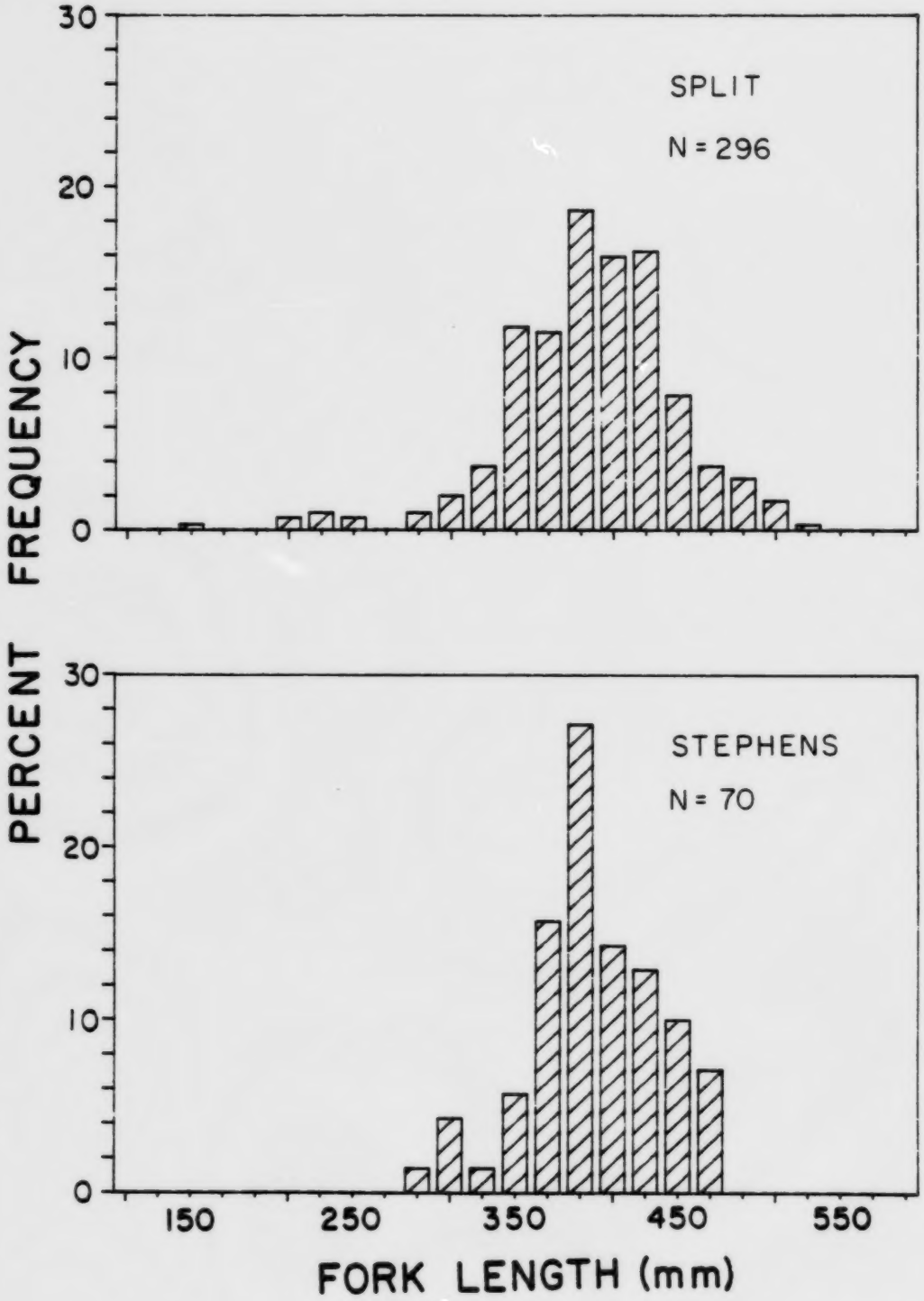

Fig. 19. Length-frequency distribution for white suckers from Split and Stephens lakes, 1988.

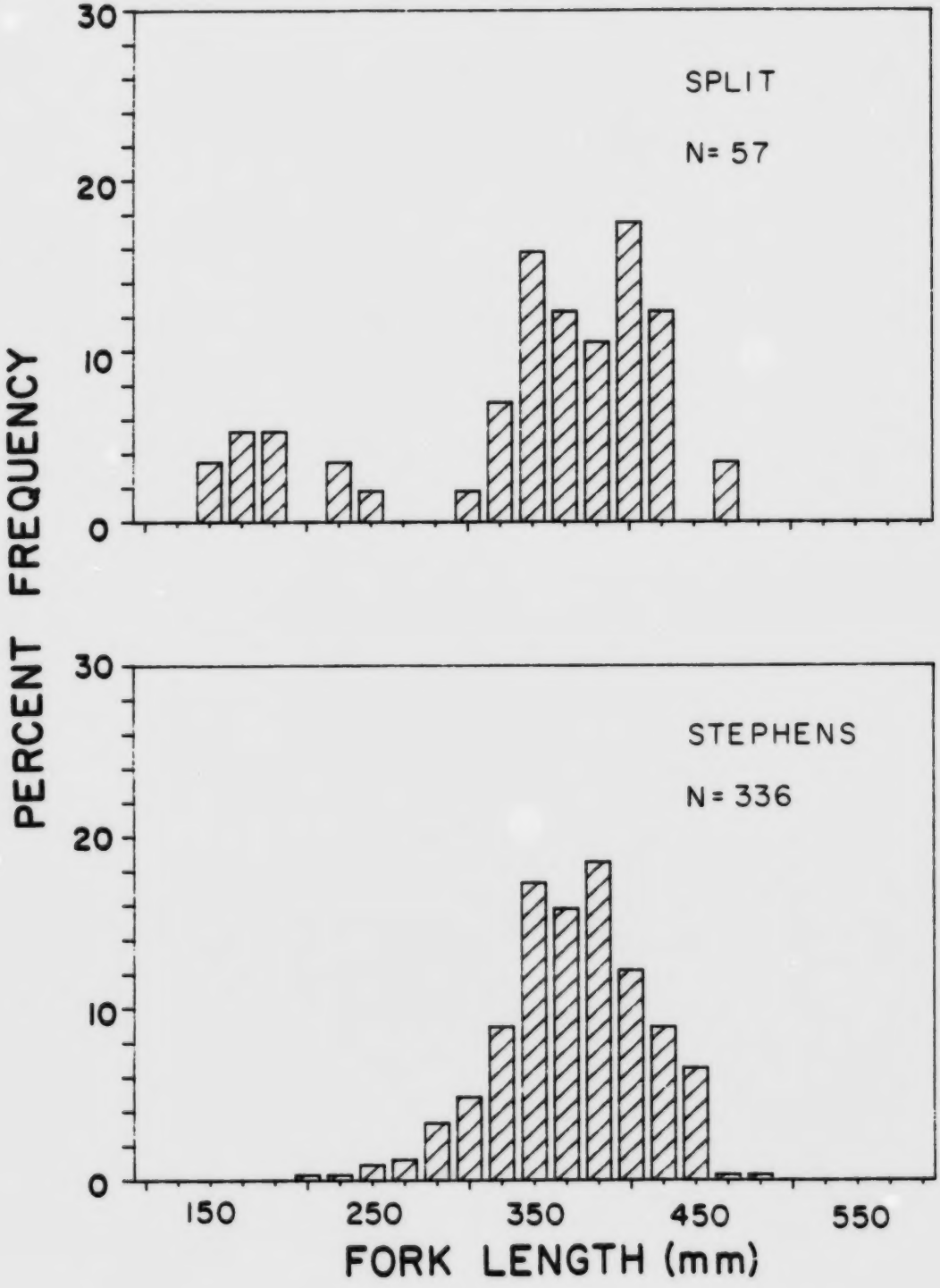

Fig. 20. Length-frequency distribution for longnose suckers from Split and Stephens lakes, 1988.

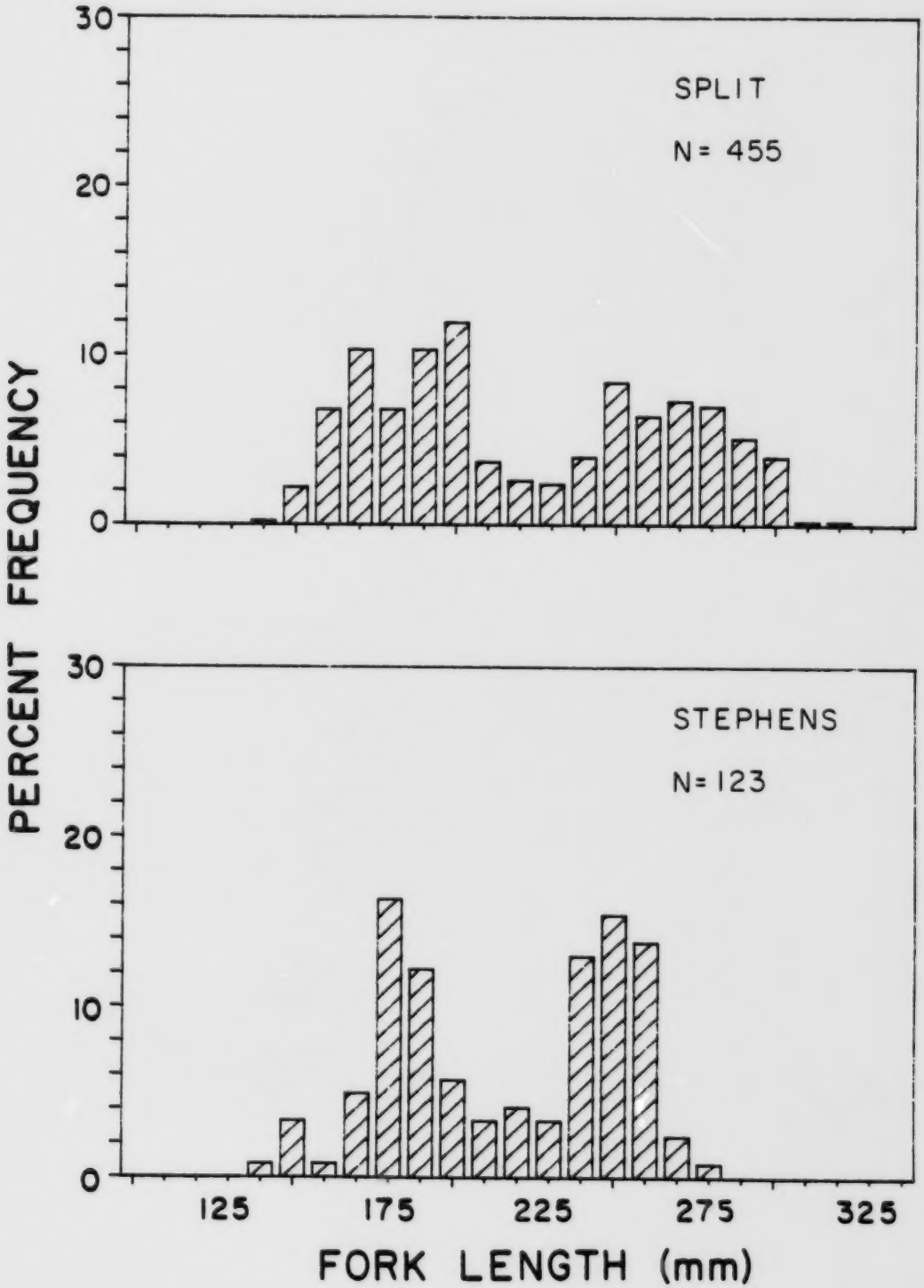

Fig. 21. Length-frequency distribution for mooneye from Split and Stephens lakes, 1988.

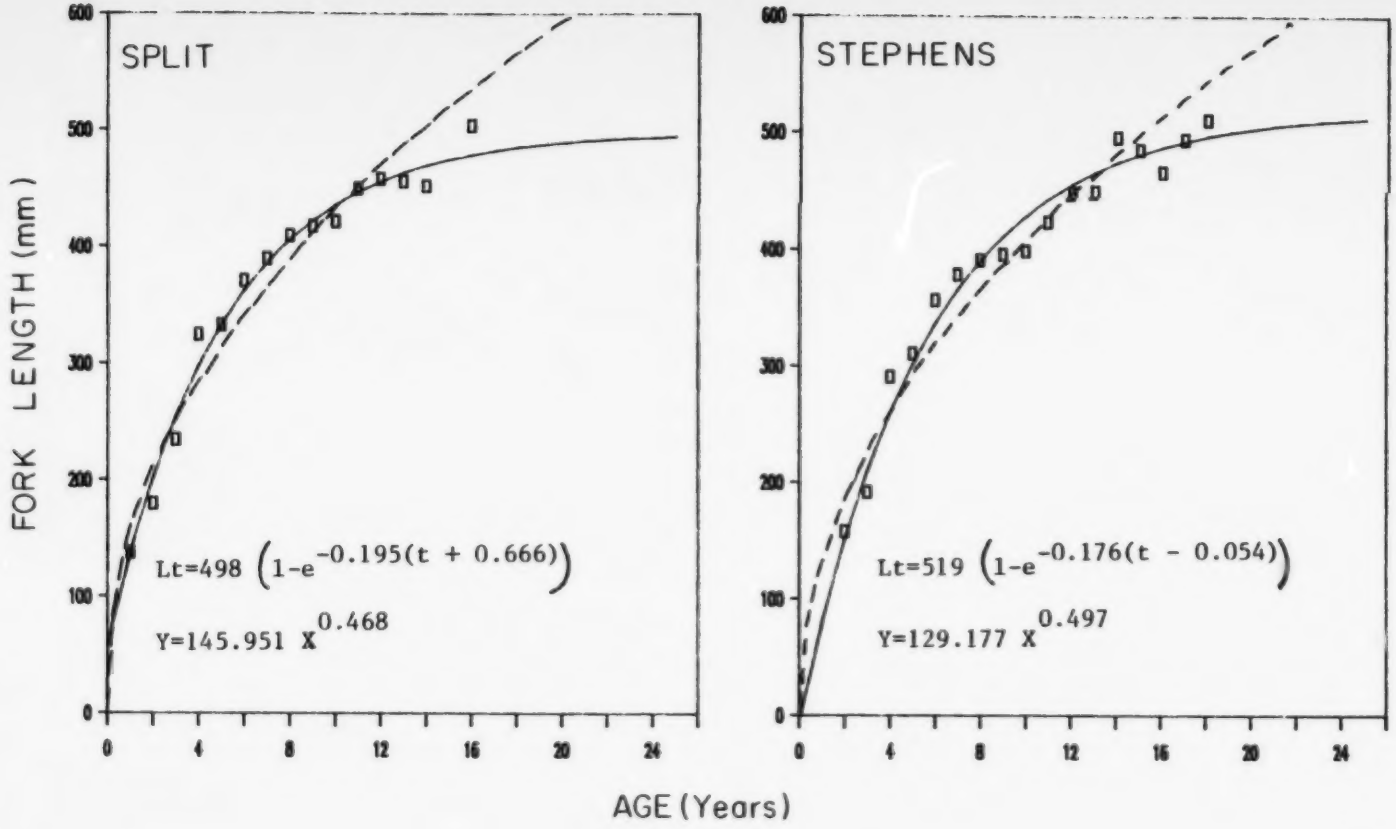

Fig. 22. von Bertalanffy (——) and power (---) regression curves for whitefish from Split and Stephens lakes, 1988.

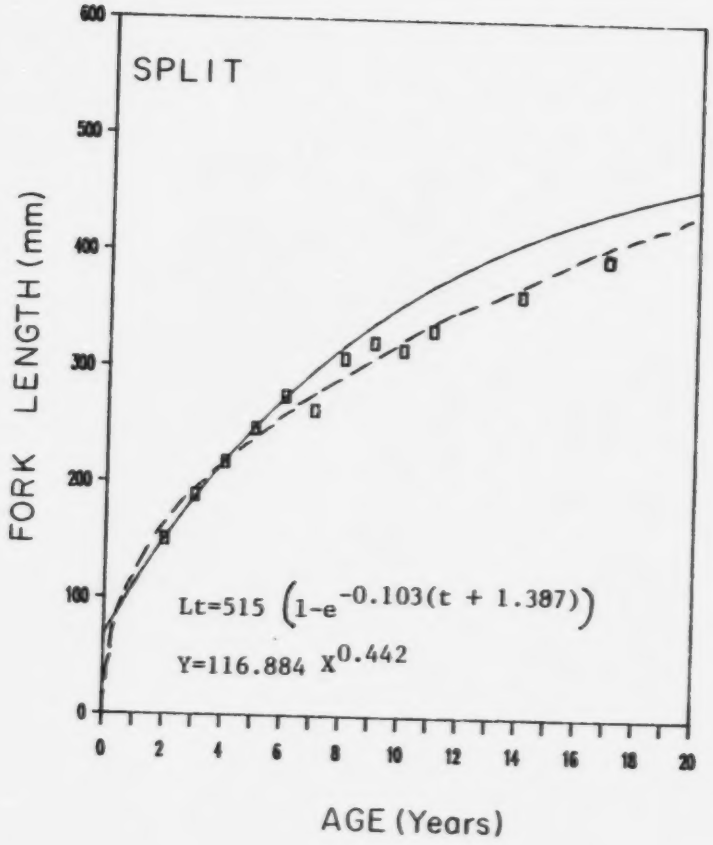

Fig. 23. von Bertalanffy (——) and power (---) regression curves for cisco from Split Lake, 1988.

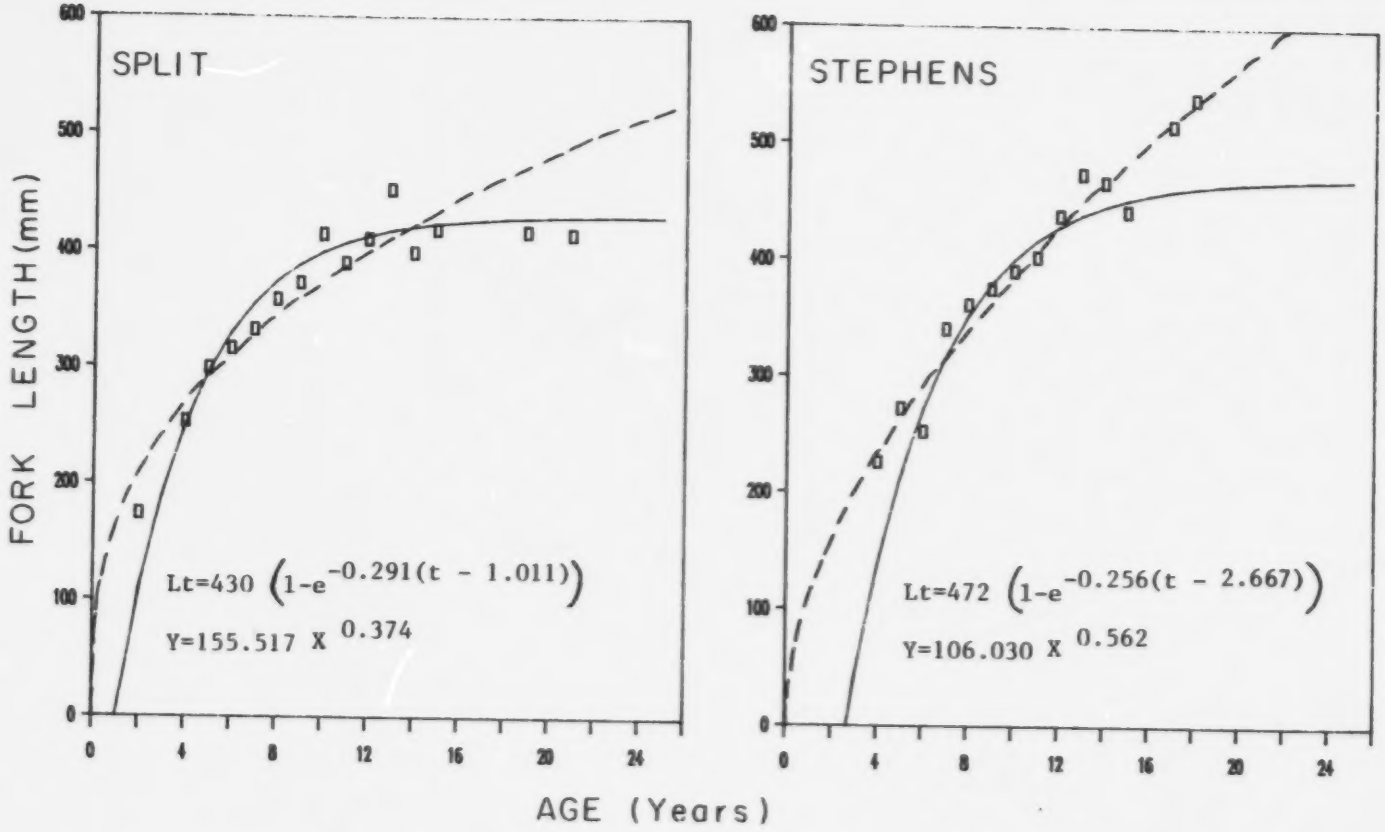

Fig. 24. von Bertalanffy (——) and power (---) regression curves for walleye from Split and Stephens lakes, 1988.

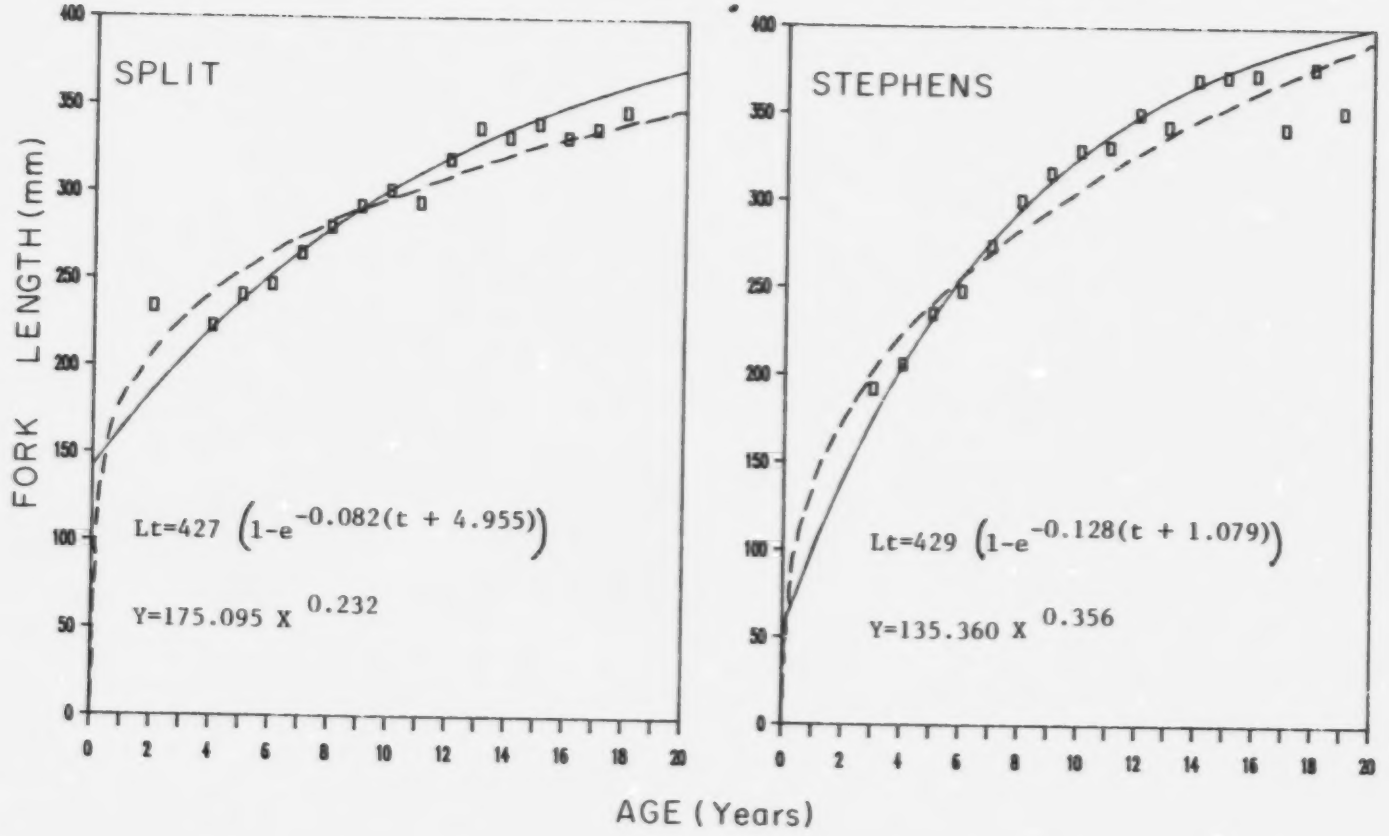

Fig. 25. von Bertalanffy (——) and power (---) regression curves for sauger from Split and Stephens lakes, 1988.

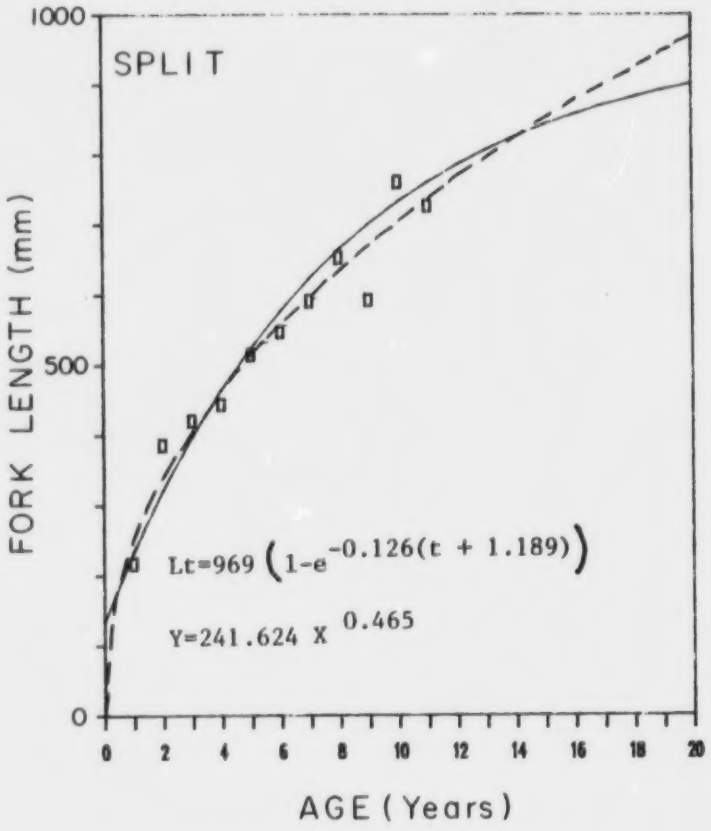

Fig. 26. von Bertalanffy (——) and power (---) regression curves for northern pike from Split Lake, 1988.

Table 1. Catch summary for experimental fishing sets in Split Lake, 1988.

Set no.	Date of Set	Whitefish	Cisco	Walleye	Sauger	Northern pike	White sucker	Longnose sucker	Mooneye	Yellow perch	Burbot	Lake chub	Goldeye	Shorthead redhorse sucker	Total
1	July 11/88	21	4	13	10	1	8	3	66	—	—	13	1	–	140
2	July 11/88	10	17	2	3	–	13	—	77	—	—	17	–	1	140
3	July 11/88	14	7	6	1	2	13	3	14	—	—	7	–	–	67
4	July 12/88	3	14	9	8	3	16	1	105	1	—	—	–	–	160
5	July 12/88	14	67	13	6	7	15	—	19	7	—	—	–	–	148
6	July 13/88	9	13	12	2	4	10	—	28	3	—	—	–	–	81
7	July 13/88	6	25	3	—	4	5	—	18	1	—	—	–	–	62
8	July 14/88	37	3	—	2	1	21	24	—	—	—	9	18	–	115
9	July 14/88	21	7	1	32	2	26	17	—	—	15	6	–	–	127
10	July 15/88	13	11	4	1	2	13	1	14	—	—	10	–	1	70
11	July 15/88	13	32	9	2	1	7	1	43	—	—	22	4	–	134
12	July 16/88	1	—	4	—	–	1	—	13	—	--	—	–	–	19
13	July 16/88	10	1	2	21	1	61	4	5	—	—	2	16	–	123
14	July 25/88	—	—	4	3	3	1	—	14	3	—	—	–	–	28
15	July 25/88	6	—	1	—	–	25	1	6	—	—	—	–	–	39
16	July 25/88	4	1	6	2	3	2	—	38	4	—	1	–	–	61
17	July 26/88	38	10	14	47	4	9	1	18	—	—	35	–	1	177
18	July 26/88	13	7	4	5	8	4	—	34	1	—	—	–	–	76
19	July 26/88	8	9	3	14	3	1	—	50	—	—	2	–	–	90
20	July 27/88	20	11	22	7	4	13	1	26	—	—	8	–	1	113
21	July 27/88	18	11	6	—	6	17	—	36	—	—	10	–	–	104
22	July 27/88	4	1	1	1	2	15	—	7	1	—	6	–	–	38
Total		283	251	139	167	61	296	57	631	21	26	171	5	4	2112

Table 2. Catch summary for experimental fishing sets in Stephens Lake, 1988.

Set no.	Date of set	Whitefish	Cisco	Walleye	Sauger	Northern pike	White sucker	Longnose sucker	Mooneye	Yellow perch	Burbot	Lake chub	Total
1	June 13/88	2	2	24	11	–	5	–	4	–	–	–	48
2	June 13/88	4	–	10	14	–	8	8	6	–	–	–	50
3	June 14/88	–	–	9	1	4	2	–	23	–	1	–	40
4	June 14/88	–	–	2	19	–	4	50	1	–	–	–	76
5	June 15/88	8	3	1	1	2	–	–	–	–	1	–	16
6	June 15/88	2	6	2	2	–	–	–	75	–	–	–	87
7	June 15/88	3	–	7	42	–	4	26	–	–	–	–	82
8	June 16/88	1	3	–	–	1	–	–	–	–	–	–	5
9	June 16/88	3	6	4	–	9	1	–	–	–	–	–	23
10	June 17/88	1	2	6	–	1	1	–	–	1	–	–	12
11	June 17/88	7	20	1	–	5	–	–	–	1	–	–	34
12	June 18/88	6	18	–	–	2	–	–	–	–	–	–	26
13	June 18/88	13	20	5	–	12	–	–	–	–	–	–	50
14	June 18/88	1	2	–	–	8	–	–	–	1	–	–	12
15	June 19/88	–	27	3	4	–	–	–	5	–	–	2	41
16	June 19/88	19	2	–	–	–	–	9	–	–	–	–	30
17	June 19/88	22	–	1	19	–	3	5	1	–	–	–	51
18	June 20/88	19	1	–	–	–	1	29	–	–	–	2	52
19	June 20/88	9	–	–	2	–	8	5	–	–	1	6	31
20	June 27/88	–	–	2	16	–	2	2	–	–	1	–	23
21	June 27/88	36	–	–	9	–	2	9	–	–	–	2	58
22	June 27/88	9	–	–	3	–	–	15	–	–	1	2	30
23	June 28/88	4	–	1	12	–	3	21	–	–	–	7	48
24	June 28/88	13	–	–	6	–	1	1	–	–	1	–	22
25	June 28/88	25	–	2	4	–	10	40	–	–	2	2	85
26	June 29/88	5	–	–	–	–	–	38	–	–	–	3	46
27	June 29/88	1	14	1	–	2	–	–	–	–	–	1	19
28	June 29/88	10	–	1	1	–	–	7	–	–	1	3	23
29	June 30/88	–	–	1	–	2	1	3	8	–	–	–	15
30	June 30/88	1	–	1	46	–	3	4	–	–	–	–	55
31	June 30/88	14	–	–	10	–	2	6	–	–	–	–	32
32	July 1/88	–	–	1	42	–	1	–	–	–	–	–	44
33	July 1/88	19	–	–	5	–	2	22	–	–	–	2	50
34	July 1/88	20	–	–	3	–	6	36	–	–	2	–	67
Total		277	126	85	272	48	70	336	123	3	11	32	1383

Table 3. Catch per unit effort (CUE) and percent frequency of occurrence for fish from Split and Stephens lakes, 1988. Number in parentheses are the number of standard gangs set in each lake.

Species	CUE (number/gang/day)		CUE (kg/gang/day)		% frequency of occurrence	
	Split (22)	Stephens (34)	Split (22)	Stephens (34)	Split	Stephens
Whitefish	12.86	8.15	7.91	9.85	13.40	20.03
Cisco	11.41	3.71	2.98	0.64	11.89	9.11
Walleye	6.32	2.50	3.67	1.59	6.58	6.15
Sauger	7.59	8.00	1.79	1.63	7.91	19.67
Northern pike	2.77	1.41	3.49	1.64	2.88	3.47
White sucker	13.45	2.06	14.26	2.11	14.02	5.06
Longnose sucker	2.59	9.88	1.82	7.48	2.70	24.30
Shorthead redhorse sucker	0.18	–	0.13	–	0.19	–
Mooneye	28.68	3.62	4.76	0.50	29.88	8.89
Goldeye	0.23	–	0.10	–	0.24	–
Yellow perch	0.95	0.09	0.11	0.005	0.99	0.22
Burbot	1.18	0.32	0.55	0.23	1.23	0.80
Lake chub	7.77	0.94	0.40	0.07	8.10	2.31
Total	96.00	40.68	41.97	25.74	100.00	100.00

Table 4. Sum weights (kg) for fish caught in 22 experimental fishing sets in Split Lake, 1988.

Species	Parameter	Mesh size (inches)						
		1.5	2.0	3.0	3.75	4.25	5.0	Total
Whitefish	N	73	48	37	45	43	37	283
	weights	6.97	8.06	23.55	38.45	47.64	49.32	173.99
Cisco	N	73	81	50	28	14	5	251
	weights	4.55	14.01	17.05	16.32	9.04	4.60	65.57
Walleye	N	16	22	50	34	12	5	139
	weights	5.89	8.79	25.54	24.02	10.73	5.85	80.82
Sauger	N	35	97	25	3	2	5	167
	weights	6.16	20.14	10.12	0.70	0.56	1.69	39.37
Northern pike	N	8	11	20	9	10	3	61
	weights	4.41	7.83	26.39	15.11	18.04	5.02	76.79
White sucker	N	4	11	73	102	72	34	296
	weights	1.56	6.14	58.53	101.92	88.85	56.79	313.78
Longnose sucker	N	7	7	12	16	15		57
	weights	0.79	1.67	8.79	13.58	15.18		40.01
Shorthead redhorse sucker	N		1	1		2		4
	weights		0.38	0.32		2.10		2.80
Mooneye	N	100	296	186	36	6	7	631
	weights	7.03	34.82	48.28	11.31	1.60	1.67	104.71
Goldeye	N		1	1	3			5
	weights		0.33	0.40	1.46			2.19
Yellow perch	N	5	13	3				21
	weights	0.48	1.18	0.74				2.41
Burbot	N		5	18	3			26
	weights		0.82	9.06	2.26			12.14
Lake chub	N	169	2					171
	weights	8.68	0.18					8.86
Total	N	490	595	476	279	176	96	2112
	weights	46.509	104.35	228.77	225.127	193.729	124.943	923.44

Table 5. Sum weights (kg) for fish caught in 34 experimental fishing sets in Stephens Lake, 1988.

Species	Parameter	Mesh size (inches)						
		1.5	2.0	3.0	3.75	4.25	5.0	Total
Whitefish	N	10	16	46	82	53	70	277
	weights	7.50	17.86	44.23	100.09	69.36	95.73	334.77
Cisco	N	23	75	20	5	2	1	126
	weights	2.00	10.94	4.84	2.58	0.56	0.90	21.82
Walleye	N	6	30	26	12	4	7	85
	weights	2.70	10.26	15.02	9.82	5.44	10.78	54.02
Sauger	N	88	124	51	5	1	3	272
	weights	11.95	19.79	20.01	2.01	0.44	1.06	55.25
Northern pike	N	3	12	26	2	3	2	48
	weights	0.96	6.06	36.36	2.32	5.14	4.92	55.76
White sucker	N	1	1	14	27	18	9	70
	weights	1.02	0.40	10.92	25.72	20.96	12.80	71.82
Longnose sucker	N	20	43	94	108	55	16	336
	weights	8.45	25.55	65.66	83.46	53.60	17.46	254.18
Mooneye	N	11	62	45	1	4	0	123
	weights	0.63	5.93	9.30	0.26	0.88	0.00	17.00
Yellow perch	N	2	1	0	0	0	0	3
	weights	0.07	0.10	0.00	0.00	0.00	0.00	0.17
Burbot	N	3	1	2	2	1	2	11
	weights	0.83	0.16	1.22	1.32	0.94	3.50	7.97
Lake chub	N	27	5	0	0	0	0	32
	weights	1.87	0.51	0.00	0.00	0.00	0.00	2.38
Total	N	194	370	324	244	141	110	1383
	weights	37.976	97.548	207.558	227.576	157.32	147.146	875.124

Table 6. Mesh size effects on whitefish from Split Lake, 1988.

	Mesh size (inches)						
	1.50	2.00	3.00	3.75	4.25	5.00	Total
Number caught	73	48	37	45	43	37	283
CUE (No/100 yds/day)	13.27	8.73	6.73	8.18	7.82	6.73	8.58
CUE (Kg/100 yds/day)	1.27	1.47	4.28	6.99	8.66	8.97	5.27
Mean Length(mm)	160 ± 56.73	213 ± 45.90	334 ± 42.02	365 ± 46.35	392 ± 44.71	421 ± 36.65	294 ± 112.13
Mean Weight(g)	95 ± 212.72	168 ± 166.26	636 ± 322.29	854 ± 380.85	1108 ± 393.48	1333 ± 335.33	615 ± 554.29
Number Mature	2	3	10	30	32	34	111
Number Immature	67	44	27	15	11	3	167
% Mature	2.9	6.4	27.02	66.7	74.4	91.9	39.9
Mean age (Years)	1.8	2.5	4.9	6.1	7.4	9.1	4.8
Age(years)	Frequency (%)						
1	57.5						14.8
2	32.9	68.8					20.1
3	4.1	22.9	10.8				6.4
4	1.4	4.2	54.1	48.9	20.9		19.1
5		2.1	10.8	2.2	7.0		3.2
6	1.4		10.8	15.6	4.7	13.5	6.7
7		2.1	2.7		7.0	10.8	3.2
8			2.7	11.1	20.9	13.5	7.1
9	1.4		2.7	8.9	27.9	24.3	9.5
10	1.4			8.9	2.3	16.2	4.2
11			2.7		9.3	10.8	3.2
12			2.7	2.2		5.4	1.4
13				2.2			0.4
14						2.7	0.4
16						2.7	0.4

+ = standard deviation
Number with unknown sex = 14
Number with unknown maturity= 5
Number with unknown age =

Table 7. Mesh size effects on whitefish catches from Stephens Lake, 1988.

	Mesh size (inches)						
	1.50	2.00	3.00	3.75	4.25	5.00	Total
Number caught	10	16	46	82	53	70	277
CUE (No/100 yds/day)	1.18	1.88	5.41	9.65	6.24	8.24	5.43
CUE (Kg/100 yds/day)	0.88	2.10	5.20	11.78	8.16	11.26	6.56
Mean Length(mm)	301 ± 139.26	381 ± 102.08	378 ± 50.53	408 ± 53.90	421 ± 51.13	425 ± 49.47	404 ± 65.35
Mean Weight(g)	750 ± 808.84	1116 ± 677.27	962 ± 416.23	1221 ± 558.02	1309 ± 576.76	1368 ± 522.25	1209 ± 568.70
Number Mature	4	11	31	71	45	66	228
Number Immature	6	5	15	11	8	4	49
% Mature	40.0	68.8	67.39	86.6	84.9	94.3	82.3
Mean age (Years)	7.1	9.8	8.0	9.7	10.3	11.2	9.8
Age(years)	Frequency (%)						
2	40.0	6.3					1.8
3		6.3					0.4
4	10.0		4.3	1.2			1.4
5		6.3	8.7	1.2	1.9		2.5
6		6.3	8.7	7.3	9.4	1.4	6.1
7			41.3	30.5	17.0	21.4	24.5
8	10.0	6.3	10.9	8.5	7.5	5.7	7.9
9	20.0	18.8	8.7	8.5	18.9	14.3	13.0
10			2.2	7.3	5.7	10.0	6.1
11		12.5	4.3	9.8	7.5	5.7	7.2
12		18.8		4.9	7.5	10.0	6.5
13			2.2	4.9	3.8	2.9	3.2
14				1.2		1.4	0.7
15		6.3	6.5	1.2	5.7	5.7	4.3
16	10.0	6.3		7.3	3.8	10.0	6.1
17	10.0	6.3	2.2	6.1	11.3	8.6	7.2
18						2.9	0.7

Total effort for each mesh size was 850 yards of net.
+ = standard deviation
Number with unknown sex =
Number with unknown maturity=
Number with unknown age =

Table 8. Mesh size effects on cisco catches from Split Lake, 1988.

	Mesh size (inches)						
	1.50	2.00	3.00	3.75	4.25	5.00	Total
Number caught	62	71	48	28	14	5	228
CUE (No/100 yds/day)	11.27	12.91	8.73	5.09	2.55	0.91	6.91
CUE (Kg/100 yds/day)	0.72	2.26	3.02	2.97	1.64	0.84	1.91
Mean Length(mm)	157 ± 30.67	220 ± 43.65	278 ± 34.81	320 ± 37.15	336 ± 30.56	369 ± 10.26	238 ± 73.02
Mean Weight(g)	64 ± 56.38	175 ± 136.35	346 ± 137.47	583 ± 211.25	645 ± 172.31	920 ± 87.18	276 ± 251.54
Number Mature	2	20	19	10	6	3	60
Number Immature	17	8					25
% Mature	10.5	71.4	100	100.0	100.0	100.0	70.6
Mean age (Years)	2.4	4.8	7.1	8.4	11.2	9.7	5.8
Age(years)	Frequency (%)						
2	75.0	3.6					18.6
3	20.0	25.0					12.8
4		25.0	10.5				10.5
5	5.0	14.3	15.8	10.0			10.5
6		10.7	21.1		16.7		9.3
7		14.3	21.1	20.0			11.6
8		3.6		20.0			3.5
9			5.3	20.0	16.7	33.3	2.2
10		3.6	21.1	20.0	16.7	66.7	11.6
11			5.3	10.0	16.7		3.5
14					16.7		1.2
17					16.7		1.2
Number of unknown ages	42	43	29	18	8	2	142

+ = standard deviation
Number with unknown sex = 143
Number with unknown maturity= 143
Number with unknown age = 142
Number bulk weighed = 23

Table 9. Mesh size effects on walleye catches from Split Lake, 1988.

	Mesh size (inches)						
	1.50	2.00	3.00	3.75	4.25	5.00	Total
Number caught	16	22	50	34	12	5	139
CUE (No/100 yds/day)	2.91	4.00	9.09	6.18	2.18	0.91	4.21
CUE (Kg/100 yds/day)	1.07	1.60	4.64	4.37	1.95	1.06	2.45
Mean Length(mm)	308 ± 64.21	321 ± 42.37	341 ± 52.06	384 ± 21.61	419 ± 19.42	439 ± 62.78	355 ± 57.18
Mean Weight(g)	368 ± 212.05	399 ± 171.40	511 ± 195.48	707 ± 116.26	894 ± 132.28	1170 ± 476.30	581 ± 267.16
Number Mature	1	6	23	30	10	4	74
Number Immature	15	16	26	4	2	1	64
% Mature	6.3	27.3	46.93	88.2	83.3	80.0	53.6
Mean age (Years)	6.6	6.9	8.4	9.8	13.5	13.0	8.9

Age(years)	Frequency (%)						
1			2.0				0.7
2	6.3						0.7
4	12.5	4.5					2.2
5	25.0	45.5	20.0				17.3
6	6.3	4.5	4.0	2.9			3.6
7	18.8	27.3	16.0	5.9			13.7
8			10.0	8.8			5.8
9	25.0	9.1	30.0	58.8	16.7	20.0	31.7
10					8.3		0.7
11		4.5		2.9			1.4
12	6.3		2.0	5.9	8.3		3.6
13				2.9		20.0	1.4
14			10.0		16.7	40.0	6.5
15			6.0	11.8	41.7	20.0	9.4
19					8.3		0.7
21		4.5					0.7

± = standard deviation
Number with unknown sex = 1
Number with unknown maturity= 1
Number with unknown age =

Table 10. Mesh size effects on walleye catches from Stephens Lake, 1988.

	Mesh size (inches)						
	1.50	2.00	3.00	3.75	4.25	5.00	Total
Number caught	6	30	26	12	4	7	85
CUE (No/100 yds/day)	0.71	3.53	3.06	1.41	0.47	0.82	1.67
CUE (Kg/100 yds/day)	0.32	1.21	1.77	1.16	0.64	1.27	1.06
Mean Length(mm)	308 ± 94.19	291 ± 72.39	357 ± 64.88	400 ± 49.77	468 ± 80.19	497 ± 21.90	353 ± 91.69
Mean Weight(g)	451 ± 527.59	342 ± 319.67	578 ± 433.56	818 ± 355.27	1360 ± 697.23	1540 ± 180.37	636 ± 525.54
Number Mature	1	4	11	6	4	7	33
Number Immature	5	26	15	6			52
% Mature	16.7	13.3	42.30	50.0	100.0	100.0	38.8
Mean age (Years)	6.8	6.4	8.5	10.3	14.5	15.0	8.7
Age(years)	Frequency (%)						
4		10.0					3.5
5	66.7	53.3	19.2				29.4
6	16.7	10.0					4.7
7		13.3	46.2	25.0			22.4
8				16.7			2.4
9		3.3	11.5	16.7			7.1
10				8.3			1.2
11					25.0		1.2
12			3.8		25.0		2.4
13			3.8			14.3	2.4
14		3.3	3.8	16.7		57.1	9.4
15	16.7	6.7	7.7	16.7			8.2
17			3.8		25.0		2.4
18					25.0	28.6	3.5

Total effort for each mesh size was 850 yards of net.
+ = standard deviation
Number with unknown sex =
Number with unknown maturity=
Number with unknown age =

Table 11. Mesh size effects on sauger catches from Split Lake, 1988.

	Mesh size (inches)						
	1.50	2.00	3.00	3.75	4.25	5.00	Total
Number caught	35	97	25	3	2	5	167
CUE (No/100 yds/day)	6.36	17.64	4.55	0.55	0.36	0.91	5.06
CUE (Kg/100 yds/day)	1.12	3.66	1.84	0.13	0.10	0.31	1.19
Mean Length(mm)	259 ± 31.31	268 ± 32.10	336 ± 17.00	275 ± 50.01	302 ± 14.14	322 ± 19.57	279 ± 39.85
Mean Weight(g)	176 ± 69.60	208 ± 89.52	405 ± 69.52	234 ± 137.60	279 ± 38.18	339 ± 81.71	236 ± 112.20
Number Mature	15	52	25	1	2	4	99
Number Immature	20	45		2		1	68
% Mature	42.9	53.6	100	33.3	100.0	80.0	59.3
Mean age (Years)	6.8	7.6	14.2	6.7	12.5	13.2	8.6
Age(years)	Frequency (%)						
2		1.0					0.6
4	14.3	5.2					6.0
5	22.9	20.6		33.3			17.4
6	11.4	12.4		33.3			10.2
7	22.9	19.6					16.2
8	5.7	9.3					6.6
9	14.3	10.3	4.0	33.3			10.2
10		2.1	12.0				3.0
11	2.9	8.2			50.0	40.0	7.2
12	2.9	6.2	8.0				5.4
13	2.9		16.0				3.0
14		3.1	20.0		50.0	20.0	6.0
15		2.1	8.0			40.0	3.6
16			4.0				0.6
17			12.0				1.8
18			16.0				2.4

± = standard deviation
Number with unknown sex =
Number with unknown maturity=
Number with unknown age =

Table 12. Mesh size effects on sauger catches from Stephens Lake, 1988.

	Mesh size (inches)						
	1.50	2.00	3.00	3.75	4.25	5.00	Total
Number caught	88	124	51	5	1	3	272
CUE (No/100 yds/day)	10.35	14.59	6.00	0.59	0.12	0.35	5.33
CUE (Kg/100 yds/day)	1.41	2.33	2.35	0.24	0.05	0.12	1.08
Mean Length(mm)	234 ± 35.85	250 ± 27.62	338 ± 28.66	322 ± 84.37	352 ± -	325 ± 72.15	264 ± 50.99
Mean Weight(g)	136 ± 73.42	160 ± 61.71	392 ± 81.10	401 ± 255.40	440 ± -	352 ± 193.99	203 ± 127.15
Number Mature	39	73	43	4	1	3	163
Number Immature	49	51	8	1			109
% Mature	44.3	58.9	84.31	80.0	100.0	100.0	59.9
Mean age (Years)	5.4	5.9	11.8	11.0	11.0	10.3	7.0
Age(years)	Frequency (%)						
3	1.1						0.4
4	22.7	3.2					8.8
5	47.7	56.5		20.0		33.3	41.9
6	8.0	19.4	2.0	20.0			12.1
7	13.6	14.5	11.8				13.2
8	1.1	1.6	3.9				1.8
9	1.1	0.8	5.9				1.8
10		0.8	13.7				2.9
11	1.1	0.8	19.6		100.0		4.8
12	1.1		3.9			33.3	1.5
13	1.1	0.8	7.8				2.2
14		0.8	13.7	40.0		33.3	4.0
15			3.9				0.7
16			2.0	20.0			0.7
17		0.8	2.0				0.7
18			5.9				1.1
19			2.0				0.4
21			2.0				0.4
Number of unknown ages	1						1

Total effort for each mesh size was 850 yards of net.
+ = standard deviation
Number with unknown sex =
Number with unknown maturity=
Number with unknown age = 1

Table 13. Mesh size effects on northern pike catches from Split Lake, 1988.

	Mesh size (inches)						
	1.50	2.00	3.00	3.75	4.25	5.00	Total
Number caught	8	11	20	9	10	3	61
CUE (No/100 yds/day)	1.45	2.00	3.64	1.64	1.82	0.55	1.85
CUE (Kg/100 yds/day)	0.80	1.42	4.80	2.75	3.28	0.91	2.33
Mean Length(mm)	377 ± 156.74	445 ± 101.13	545 ± 93.52	603 ± 59.22	605 ± 91.15	587 ± 115.14	525 ± 126.07
Mean Weight(g)	551 ± 620.17	712 ± 378.29	1319 ± 814.30	1679 ± 628.54	1804 ± 725.20	1673 ±1070.58	1259 ± 809.96
Number Mature	2	8	13	9	10	3	45
Number Immature	6	3	7				16
% Mature	25.0	72.7	65	100.0	100.0	100.0	73.8
Mean age (Years)	3.4	4.8	5.7	6.6	7.2	6.7	5.7
Age(years)	Frequency (%)						
1	37.5						4.9
2	12.5	18.2	5.0				6.6
3			10.0				3.3
4	12.5	36.4	15.0				13.1
5	12.5	9.1	15.0	33.3	20.0	33.3	18.0
6	12.5	18.2	15.0	11.1	20.0		14.8
7	12.5	9.1	25.0	33.3	20.0	33.3	21.3
8			10.0	11.1	20.0	33.3	9.8
9		9.1		11.1	10.0		4.9
10			5.0				1.6
11					10.0		1.6

± = standard deviation
Number with unknown sex =
Number with unknown maturity=
Number with unknown age =

Table 14. Mesh size effects on northern pike catches from Stephens Lake, 1988.

	Mesh size (inches)						
	1.50	2.00	3.00	3.75	4.25	5.00	Total
Number caught	3	12	26	2	3	2	48
CUE (No/100 yds/day)	0.35	1.41	3.06	0.24	0.35	0.24	0.94
CUE (Kg/100 yds/day)	0.11	0.71	4.28	0.27	0.60	0.58	1.09
Mean Length(mm)	351 ± 74.33	396 ± 74.85	542 ± 154.32	543 ± 24.04	635 ± 65.43	677 ± 94.75	505 ± 149.41
Mean Weight(g)	320 ± 183.30	505 ± 278.71	1398 ±1698.04	1160 ± 197.99	1713 ± 273.01	2460 ±1018.23	1162 ±1362.66
Number Mature	2	8	19	1	3	2	35
Number Immature	1	4	7	1			13
% Mature	66.7	66.7	73.07	50.0	100.0	100.0	72.9
Mean age (Years)	3.0	4.1	5.8	5.5	8.0	9.0	5.4
Age(years)	Frequency (%)						
2	33.3	8.3					4.2
3	33.3	41.7	7.7				16.7
4	33.3	16.7	30.8				22.9
5		8.3	30.8	50.0			20.8
6		16.7	7.7	50.0			10.4
7		8.3	3.8		33.3		6.3
8			7.7		33.3	50.0	8.3
9					33.3		2.1
10						50.0	2.1
12			7.7				4.2
13			3.8				2.1

Total effort for each mesh size was 850 yards of net.
± = standard deviation
Number with unknown sex =
Number with unknown maturity=
Number with unknown age =

Table 15. Mesh size effects on white sucker, longnose sucker and shorthead redhorse sucker catches from Split Lake, 1988.

Species		Mesh size (inches)						
		1.50	2.00	3.00	3.75	4.25	5.00	Total
White sucker	Number caught	4	11	73	102	72	34	296
	CUE (No/100 yds/day)	0.73	2.00	13.27	18.55	13.09	6.18	8.97
	CUE (Kg/100 yds/day)	0.28	1.12	10.64	18.53	16.15	10.33	9.51
	Mean Length(mm)	276 ± 104.32	302 ± 89.10	365 ± 37.72	392 ± 34.12	418 ± 26.76	462 ± 32.05	395 ± 52.95
	Mean Weight(g)	389 ± 366.45	558 ± 470.43	802 ± 274.78	999 ± 262.00	1234 ± 249.14	1670 ± 356.91	1060 ± 404.46
Longnose sucker	Number caught	7	7	12	16	15		57
	CUE (No/100 yds/day)	1.27	1.27	2.18	2.91	2.73		1.73
	CUE (Kg/100 yds/day)	0.14	0.30	1.60	2.47	2.76		1.21
	Mean Length(mm)	189 ± 63.10	245 ± 53.65	369 ± 25.24	385 ± 33.26	408 ± 35.07		346 ± 85.91
	Mean Weight(g)	113 ± 135.91	238 ± 149.66	733 ± 159.86	849 ± 196.63	1012 ± 250.46		702 ± 371.29
Shorthead redhorse sucker	Number caught		1	1		2		4
	CUE (No/100 yds/day)		0.18	0.18		0.36		0.12
	CUE (Kg/100 yds/day)		0.07	0.06		0.38		0.08
	Mean Length(mm)		290 ± -	270 ± -		400 ± 14.14		340 ± 70.24
	Mean Weight(g)		376 ± -	320 ± -		1050 ± 296.98		699 ± 440.67

Table 16. Mesh size effects on cisco, white sucker and longnose sucker catches from Stephens Lake, 1988.

Species		Mesh size (inches)						
		1.50	2.00	3.00	3.75	4.25	5.00	Total
Cisco	Number caught	23	75	20	5	2	1	126
	CUE (No/100 yds/day)	2.71	8.82	2.35	0.59	0.24	0.12	2.47
	CUE (Kg/100 yds/day)	0.23	1.29	0.57	0.30	0.07	0.11	0.43
	Mean Length(mm)	171 ± 44.82	210 ± 25.82	252 ± 27.03	302 ± 47.90	267 ± 46.67	336 ± -	215 ± 44.76
	Mean Weight(g)	87 ± 68.21	146 ± 53.32	242 ± 81.80	516 ± 303.12	280 ± 169.71	900 ± -	173 ± 135.56
White sucker	Number caught	1	1	14	27	18	9	70
	CUE (No/100 yds/day)	0.12	0.12	1.65	3.18	2.12	1.06	1.37
	CUE (Kg/100 yds/day)	0.12	0.05	1.28	3.03	2.47	1.51	1.41
	Mean Length(mm)	390 ± -	392 ± -	362 ± 46.77	389 ± 28.70	413 ± 26.05	446 ± 26.10	397 ± 40.28
	Mean Weight(g)	1020 ± -	400 ± -	780 ± 290.04	953 ± 269.25	1164 ± 229.84	1422 ± 204.56	1026 ± 326.46
Longnose sucker	Number caught	20	43	94	108	55	16	336
	CUE (No/100 yds/day)	2.35	5.06	11.06	12.71	6.47	1.88	6.59
	CUE (Kg/100 yds/day)	0.99	3.01	7.72	9.82	6.31	2.05	4.98
	Mean Length(mm)	303 ± 70.67	342 ± 44.72	365 ± 40.27	376 ± 33.13	408 ± 26.13	424 ± 31.15	372 ± 47.40
	Mean Weight(g)	423 ± 239.16	594 ± 201.55	699 ± 217.18	773 ± 187.43	975 ± 182.19	1091 ± 255.18	756 ± 255.23

Total effort for each mesh size was 750 yards of net.
± = standard devition

Table 17. Mesh size effects on mooneye and goldeye catches from Split Lake, 1988.

Species		Mesh size (inches)						
		1.50	2.00	3.00	3.75	4.25	5.00	Total
Mooneye	Number caught	81	211	123	27	6	7	455 *
	CUE (No/100 yds/day)	14.73	38.36	22.36	4.91	1.09	1.27	13.79
	CUE (Kg/100 yds/day)	1.05	4.67	5.84	1.52	0.29	0.30	2.28
	Mean Length(mm)	168 ± 27.84	200 ± 39.82	259 ± 18.07	273 ± 23.47	260 ± 46.61	253 ± 17.46	216 ± 47.89
	Mean Weight(g)	72 ± 58.21	122 ± 66.08	261 ± 53.58	309 ± 66.56	266 ± 123.07	239 ± 56.07	165 ± 101.14
Goldeye	Number caught		1	1	3			5
	CUE (No/100 yds/day)		0.18	0.18	0.55			0.15
	CUE (Kg/100 yds/day)		0.06	0.07	0.27			0.07
	Mean Length(mm)		292 ± -	308 ± -	321 ± 36.90			312 ± 29.00
	Mean Weight(g)		330 ± -	400 ± -	487 ± 130.13			438 ± 116.28

* 176 bulk weighed

Table 18. Mesh size effects on burbot, yellow perch and lake chub catches from Split Lake, 1988.

Species		Mesh size (inches)						
		1.50	2.00	3.00	3.75	4.25	5.00	Total
Burbot	Number caught		5	18	3			26
	CUE (No/100 yds/day)		0.91	3.27	0.55			0.79
	CUE (Kg/100 yds/day)		0.15	1.65	0.41			0.37
	Mean Length(mm)		281 ± 6.26	422 ± 37.04	471 ± 25.32			400 ± 69.06
	Mean Weight(g)		163 ± 18.25	503 ± 96.83	753 ± 117.19			467 ± 191.77
Yellow perch	Number caught	5	13	3				21
	CUE (No/100 yds/day)	0.91	2.36	0.55				0.64
	CUE (Kg/100 yds/day)	0.09	0.22	0.13				0.07
	Mean Length(mm)	171 ± 56.86	179 ± 15.16	247 ± 7.57				187 ± 38.04
	Mean Weight(g)	97 ± 108.59	91 ± 28.03	247 ± 19.73				115 ± 77.15
Lake chub	Number caught	110	2					112 *
	CUE (No/100 yds/day)	20.00	0.36					3.39
	CUE (Kg/100 yds/day)	1.03	0.03					0.18
	Mean Length(mm)	156 ± 14.08	185 ± 1.41					156 ± 14.50
	Mean Weight(g)	51 ± 13.00	90 ± 5.66					52 ± 13.88

* 59 bulk weighed

Table 19. Mesh size effects on mooneye, yellow perch, burbot and lake chub catches from Stephens Lake, 1988.

Species		Mesh size (inches)						
		1.50	2.00	3.00	3.75	4.25	5.00	Total
Mooneye	Number caught	11	62	45	1	4		123
	CUE (No/100 yds/day)	1.29	7.29	5.29	0.12	0.47		2.41
	CUE (Kg/100 yds/day)	0.07	0.70	1.09	0.03	0.10		0.33
	Mean Length(mm)	164 ± 30.54	191 ± 23.71	244 ± 9.18	260 ± -	248 ± 15.66		211 ± 35.39
	Mean Weight(g)	57 ± 48.60	96 ± 48.79	207 ± 30.75	260 ± -	220 ± 51.64		138 ± 73.30
Yellow perch	Number caught	2	1					3
	CUE (No/100 yds/day)	0.24	0.12					0.06
	CUE (Kg/100 yds/day)	0.01	0.01					0.00
	Mean Length(mm)	137 ± 1.41	188 ±					154 ± 29.46
	Mean Weight(g)	35 ± 7.07	100 ±					57 ± 37.86
Burbot	Number caught	3	1	2	2	1	2	11
	CUE (No/100 yds/day)	0.35	0.12	0.24	0.24	0.12	0.24	0.22
	CUE (Kg/100 yds/day)	0.10	0.02	0.14	0.16	0.11	0.41	0.16
	Mean Length(mm)	299 ± 183.48	288 ± -	460 ± 11.31	456 ± 25.46	534 ± -	633 ± 4.24	438 ± 153.54
	Mean Weight(g)	276 ± 384.77	160 ± -	610 ± 42.43	660 ± 56.57	940 ± -	1750 ± 127.28	724 ± 585.12
Lake chub	Number caught	27	5					32
	CUE (No/100 yds/day)	3.18	0.59					0.63
	CUE (Kg/100 yds/day)	0.22	0.07					0.05
	Mean Length(mm)	174 ± 15.22	194 ± 3.16					177 ± 15.88
	Mean Weight(g)	69 ± 16.29	101 ± 18.63					74 ± 20.19

Total effort for each mesh size was 750 yards of net.
± = standard devition

Table 20. Age specific size and maturity conditions of whitefish from Split Lake, 1988.

Sex	Age (Years)	Number	Maturity: Number Mature	Maturity: % Mature	Fl ± s.d. (mm)	Wt ± s.d. (g)	Mean Condition Factor
Males	1	20	0	0.0	139 ± 7.16	36 ± 6.09	1.33
	2	30	0	0.0	181 ± 23.59	88 ± 32.43	1.42
	3	9	0	0.0	241 ± 44.62	228 ± 135.11	1.48
	4	26	8	30.8	325 ± 24.13	557 ± 183.95	1.59
	5	4	2	50.0	326 ± 7.19	572 ± 47.28	1.66
	6	8	6	75.0	376 ± 22.89	925 ± 157.03	1.73
	7	7	7	100.0	390 ± 18.92	1040 ± 137.60	1.75
	8	14	14	100.0	411 ± 22.34	1210 ± 214.37	1.73
	9	11	9	81.8	416 ± 28.30	1304 ± 265.45	1.79
	10	6	6	100.0	417 ± 22.44	1293 ± 183.59	1.78
	11	4	4	100.0	438 ± 13.56	1450 ± 214.48	1.72
	12	2	2	100.0	458 ± 2.83	1705 ± 77.78	1.77
	14	1	1	100.0	452 ± -	1620 ± -	1.75
Total		142	59	41.5	294 ± 110.42	611 ± 536.21	1.57
Females	1	15	0	0.0	137 ± 7.32	35 ± 5.37	1.34
	2	20	0	0.0	179 ± 24.43	83 ± 30.43	1.38
	3	9	2	22.2	229 ± 47.69	204 ± 124.33	1.50
	4	28	6	21.4	325 ± 15.46	546 ± 93.09	1.58
	5	5	0	0.0	340 ± 14.52	613 ± 144.40	1.54
	6	11	6	54.5	367 ± 27.75	829 ± 224.34	1.64
	7	2	2	100.0	391 ± 9.90	985 ± 21.21	1.65
	8	6	6	100.0	408 ± 26.55	1272 ± 224.71	1.85
	9	16	16	100.0	419 ± 18.88	1344 ± 205.04	1.82
	10	6	5	83.3	427 ± 18.36	1413 ± 254.14	1.80
	11	5	5	100.0	459 ± 21.48	1640 ± 328.33	1.72
	12	2	2	100.0	457 ± 29.70	1670 ± 183.85	1.75
	13	1	1	100.0	456 ± -	1760 ± -	1.86
	16	1	1	100.0	504 ± -	2100 ± -	1.64
Total		127	52	40.9	309 ± 109.57	681 ± 571.43	1.58
Both	1	35	0	0.0	138 ± 7.17	36 ± 5.74	1.34
	2	50	0	0.0	180 ± 23.70	86 ± 31.43	1.41
	3	18	2	11.1	235 ± 45.23	216 ± 126.56	1.49
	4	54	14	25.9	325 ± 19.91	551 ± 142.87	1.58
	5	9	2	22.2	333 ± 13.42	595 ± 108.36	1.59
	6	19	12	63.2	371 ± 25.49	870 ± 199.74	1.68
	7	9	9	100.0	390 ± 16.76	1028 ± 121.84	1.73
	8	20	20	100.0	410 ± 22.99	1229 ± 213.47	1.77
	9	27	25	92.6	418 ± 22.69	1328 ± 227.53	1.81
	10	12	11	91.7	422 ± 20.23	1353 ± 220.47	1.79
	11	9	9	100.0	450 ± 20.60	1556 ± 284.92	1.72
	12	4	4	100.0	458 ± 17.23	1688 ± 117.01	1.76
	13	1	1	100.0	456 ± -	1760 ± -	1.86
	14	1	1	100.0	452 ± -	1620 ± -	1.75
	16	1	1	100.0	504 ± -	2100 ± -	1.64
Total		269	111	41.3	301 ± 110.04	644 ± 553.19	1.58

± = standard deviation
Number of fish with unknown age that were excluded = 0
Number of fish with unknown sex that were excluded = 14
Number of fish with unknown mat that were excluded = 5

Table 21. Age specific size and maturity conditions of whitefish from Stephens Lake, 1988.

Sex	Age (Years)	Number	Maturity: Number Mature	Maturity: % Mature	Fl ± s.d. (mm)	Wt ± s.d. (g)	Mean Condition Factor
Males	4	3	0	0.0	281 ± 27.59	317 ± 106.93	1.40
	5	5	1	20.0	323 ± 32.58	528 ± 166.49	1.53
	6	8	6	75.0	347 ± 44.30	713 ± 256.11	1.62
	7	42	34	81.0	378 ± 27.24	902 ± 228.42	1.64
	8	8	5	62.5	399 ± 35.90	1103 ± 319.72	1.68
	9	18	18	100.0	394 ± 25.91	1026 ± 196.66	1.66
	10	7	7	100.0	412 ± 22.03	1214 ± 236.56	1.72
	11	11	11	100.0	420 ± 22.41	1244 ± 218.51	1.67
	12	8	8	100.0	456 ± 28.74	1620 ± 363.00	1.69
	13	3	3	100.0	441 ± 18.04	1473 ± 180.37	1.72
	14	2	2	100.0	496 ± 22.63	2030 ± 155.56	1.67
	15	4	4	100.0	458 ± 57.43	1620 ± 628.86	1.60
	16	10	10	100.0	475 ± 21.07	1880 ± 288.60	1.74
	17	9	9	100.0	476 ± 28.71	1924 ± 387.14	1.77
	18	1	1	100.0	510 ± -	2380 ± -	1.79
Total		139	119	85.6	404 ± 54.23	1173 ± 498.55	1.66
Females	2	5	0	0.0	158 ± 10.90	55 ± 15.34	1.37
	3	1	0	0.0	192 ± -	80 ± -	1.13
	4	1	0	0.0	320 ± -	500 ± -	1.53
	5	2	0	0.0	281 ± 35.36	340 ± 141.42	1.48
	6	9	4	44.4	366 ± 45.37	877 ± 331.06	1.68
	7	26	18	69.2	380 ± 20.57	915 ± 171.91	1.65
	8	14	12	85.7	386 ± 36.03	981 ± 310.28	1.66
	9	18	16	88.9	399 ± 15.67	1104 ± 183.92	1.73
	10	10	10	100.0	390 ± 26.50	968 ± 220.54	1.60
	11	9	9	100.0	430 ± 29.49	1389 ± 367.03	1.71
	12	10	10	100.0	442 ± 19.37	1520 ± 272.44	1.74
	13	6	6	100.0	453 ± 24.39	1630 ± 302.46	1.75
	15	8	7	87.5	499 ± 34.31	2328 ± 554.56	1.85
	16	7	6	85.7	454 ± 33.93	1580 ± 409.88	1.65
	17	11	11	100.0	509 ± 36.43	2318 ± 465.91	1.74
	18	1	0	0.0	512 ± -	2560 ± -	1.91
Total		138	109	79.0	404 ± 75.11	1244 ± 631.37	1.68
Both	2	5	0	0.0	158 ± 10.90	55 ± 15.34	1.37
	3	1	0	0.0	192 ± -	80 ± -	1.13
	4	4	0	0.0	291 ± 29.91	363 ± 126.59	1.43
	5	7	1	14.3	311 ± 36.60	474 ± 173.86	1.51
	6	17	10	58.8	357 ± 44.53	799 ± 301.05	1.66
	7	68	52	76.5	379 ± 24.76	907 ± 207.35	1.64
	8	22	17	77.3	391 ± 35.70	1025 ± 311.81	1.67
	9	36	34	94.4	396 ± 21.23	1065 ± 191.81	1.70
	10	17	17	100.0	399 ± 26.40	1069 ± 252.90	1.65
	11	20	20	100.0	424 ± 25.60	1309 ± 295.54	1.69
	12	18	18	100.0	448 ± 24.21	1564 ± 310.11	1.72
	13	9	9	100.0	449 ± 22.16	1578 ± 267.29	1.74
	14	2	2	100.0	496 ± 22.63	2030 ± 155.56	1.67
	15	12	11	91.7	485 ± 45.23	2092 ± 651.85	1.76
	16	17	16	94.1	466 ± 28.14	1756 ± 364.71	1.70
	17	20	20	100.0	494 ± 36.49	2141 ± 466.63	1.75
	18	2	1	50.0	511 ± 1.41	2470 ± 127.28	1.85
Total		277	228	82.3	404 ± 65.35	1209 ± 568.70	1.67

± = standard deviation
Number of fish with unknown age that were excluded = 0
Number of fish with unknown sex that were excluded = 0
Number of fish with unknown mat that were excluded = 0

Table 22. Age specific size and maturity conditions of cisco from Split Lake, 1988.

Sex	Age (Years)	Number	Maturity: Number Mature	Maturity: % Mature	Fl ± s.d. (mm)	Wt ± s.d. (g)	Mean Condition Factor
Males	2	9	0	0.0	151 ± 7.56	48 ± 8.65	1.37
	3	6	0	0.0	189 ± 9.00	92 ± 13.59	1.37
	4	4	3	75.0	210 ± 27.34	139 ± 52.98	1.46
	5	1	1	100.0	230 ± -	164 ± -	1.35
	6	3	3	100.0	279 ± 38.07	354 ± 119.62	1.60
	7	5	5	100.0	270 ± 15.10	303 ± 70.69	1.54
	8	1	1	100.0	362 ± -	920 ± -	1.94
	9	2	2	100.0	311 ± 43.84	520 ± 197.99	1.69
	10	6	6	100.0	311 ± 34.82	502 ± 178.71	1.61
	14	1	1	100.0	364 ± -	860 ± -	1.78
	17	1	1	100.0	400 ± -	940 ± -	1.47
Total		39	23	59.0	240 ± 74.56	283 ± 264.49	1.50
Females	2	6	0	0.0	151 ± 3.03	48 ± 3.67	1.40
	3	5	4	80.0	189 ± 16.77	98 ± 21.97	1.45
	4	5	3	60.0	224 ± 39.47	188 ± 109.25	1.50
	5	8	8	100.0	249 ± 21.70	257 ± 66.91	1.63
	6	5	5	100.0	272 ± 30.21	314 ± 95.87	1.52
	7	5	5	100.0	255 ± 4.60	268 ± 48.79	1.60
	8	2	2	100.0	281 ± 18.38	400 ± 169.71	1.75
	9	3	3	100.0	329 ± 26.03	673 ± 211.97	1.85
	10	4	4	100.0	324 ± 49.86	642 ± 314.99	1.79
	11	3	3	100.0	333 ± 37.17	605 ± 228.09	1.57
Total		46	37	80.4	249 ± 61.93	302 ± 235.65	1.58
Both	2	15	0	0.0	151 ± 5.99	48 ± 6.91	1.38
	3	11	4	36.4	189 ± 12.37	95 ± 17.19	1.40
	4	9	6	66.7	218 ± 33.43	166 ± 87.68	1.48
	5	9	9	100.0	247 ± 21.26	247 ± 69.84	1.60
	6	8	8	100.0	275 ± 30.85	329 ± 98.88	1.55
	7	10	10	100.0	263 ± 13.10	285 ± 60.26	1.57
	8	3	3	100.0	308 ± 48.54	573 ± 323.32	1.81
	9	5	5	100.0	322 ± 30.21	612 ± 198.29	1.79
	10	10	10	100.0	316 ± 39.26	558 ± 236.78	1.68
	11	3	3	100.0	333 ± 37.17	605 ± 228.09	1.57
	14	1	1	100.0	364 ± -	860 ± -	1.78
	17	1	1	100.0	400 ± -	940 ± -	1.47
Total		85	60	70.6	245 ± 67.73	293 ± 247.96	1.54

± = standard deviation
Number of fish with unknown age that were excluded = 142
Number of fish with unknown sex that were excluded = 143
Number of fish with unknown mat that were excluded = 143

Table 23. Age specific size and maturity conditions of walleye from Split Lake, 1988.

Sex	Age (Years)	Number	Maturity: Number Mature	Maturity: % Mature	Fl ± s.d. (mm)	Wt ± s.d. (g)	Mean Condition Factor
Males	2	1	0	0.0	174 ± -	56 ± -	1.06
	4	1	1	100.0	280 ± -	238 ± -	1.08
	5	16	1	6.3	299 ± 20.92	318 ± 65.94	1.17
	6	1	0	0.0	284 ± -	270 ± -	1.18
	7	11	4	36.4	327 ± 28.09	427 ± 126.91	1.19
	8	5	4	80.0	358 ± 9.91	600 ± 73.03	1.30
	9	16	14	87.5	367 ± 23.72	610 ± 113.42	1.22
	11	2	2	100.0	389 ± 4.24	782 ± 39.60	1.33
	12	2	1	50.0	407 ± 63.64	850 ± 410.12	1.21
	13	1	1	100.0	400 ± -	680 ± -	1.06
	14	5	5	100.0	372 ± 20.10	632 ± 124.77	1.22
	15	7	7	100.0	404 ± 28.12	832 ± 171.89	1.24
	19	1	1	100.0	416 ± -	800 ± -	1.11
	21	1	1	100.0	414 ± -	760 ± -	1.07
Total		70	42	60.0	347 ± 49.45	537 ± 220.62	1.20
Females	4	2	0	0.0	239 ± 15.56	153 ± 43.84	1.10
	5	8	2	25.0	299 ± 26.81	302 ± 73.09	1.12
	6	4	1	25.0	324 ± 37.89	397 ± 147.06	1.14
	7	8	2	25.0	340 ± 12.67	480 ± 50.72	1.21
	8	3	1	33.3	357 ± 16.29	571 ± 91.09	1.25
	9	28	13	46.4	375 ± 27.51	651 ± 144.87	1.21
	10	1	1	100.0	414 ± -	900 ± -	1.27
	12	3	2	66.7	411 ± 18.15	793 ± 90.18	1.14
	13	1	1	100.0	504 ± -	1500 ± -	1.17
	14	4	4	100.0	432 ± 16.52	1053 ± 198.56	1.30
	15	6	5	83.3	434 ± 36.86	1024 ± 370.69	1.21
Total		68	32	47.1	367 ± 54.10	636 ± 294.76	1.20
Both	2	1	0	0.0	174 ± -	56 ± -	1.06
	4	3	1	33.3	253 ± 26.10	181 ± 58.05	1.10
	5	24	3	12.5	299 ± 22.46	312 ± 67.24	1.15
	6	5	1	20.0	316 ± 37.27	372 ± 139.45	1.15
	7	19	6	31.6	332 ± 23.41	449 ± 103.25	1.20
	8	8	5	62.5	358 ± 11.49	590 ± 75.13	1.28
	9	44	27	61.4	372 ± 26.25	636 ± 134.44	1.22
	10	1	1	100.0	414 ± -	900 ± -	1.27
	11	2	2	100.0	389 ± 4.24	782 ± 39.60	1.33
	12	5	3	60.0	410 ± 34.39	816 ± 216.98	1.17
	13	2	2	100.0	452 ± 73.54	1090 ± 579.83	1.12
	14	9	9	100.0	398 ± 35.89	819 ± 267.83	1.25
	15	13	12	92.3	418 ± 34.59	921 ± 286.38	1.23
	19	1	1	100.0	416 ± -	800 ± -	1.11
	21	1	1	100.0	414 ± -	760 ± -	1.07
Total		138	74	53.6	357 ± 52.56	586 ± 263.56	1.20

± = standard deviation
Number of fish with unknown age that were excluded = 0
Number of fish with unknown sex that were excluded = 1
Number of fish with unknown mat that were excluded = 1

Table 24. Age specific size and maturity conditions of walleye from Stephens Lake, 1988.

Sex	Age (Years)	Number	Maturity: Number Mature	Maturity: % Mature	Fl ± s.d. (mm)	Wt ± s.d. (g)	Mean Condition Factor
Males	4	1	0	0.0	236 ± -	160 ± -	1.22
	5	14	0	0.0	273 ± 25.64	241 ± 64.75	1.17
	6	1	0	0.0	262 ± -	180 ± -	1.00
	7	5	3	60.0	331 ± 14.87	388 ± 67.23	1.06
	9	3	3	100.0	363 ± 15.28	560 ± 40.00	1.17
	10	1	1	100.0	390 ± -	800 ± -	1.35
	14	2	2	100.0	432 ± 0.00	960 ± 56.57	1.19
	15	4	4	100.0	413 ± 58.44	905 ± 450.59	1.22
Total		31	13	41.9	321 ± 66.48	441 ± 315.20	1.16
Females	4	2	0	0.0	221 ± 1.41	110 ± 14.14	1.02
	5	11	0	0.0	271 ± 33.69	233 ± 79.13	1.13
	6	3	0	0.0	249 ± 18.90	190 ± 43.59	1.22
	7	14	0	0.0	343 ± 34.92	476 ± 154.85	1.14
	8	2	0	0.0	361 ± 18.38	530 ± 42.43	1.13
	9	3	1	33.3	387 ± 38.07	693 ± 219.39	1.17
	11	1	1	100.0	402 ± -	740 ± -	1.14
	12	2	2	100.0	438 ± 5.66	1050 ± 127.28	1.25
	13	2	2	100.0	474 ± 19.80	1310 ± 155.56	1.23
	14	6	6	100.0	479 ± 32.51	1392 ± 270.73	1.25
	15	3	3	100.0	481 ± 12.06	1347 ± 170.10	1.20
	17	2	2	100.0	516 ± 93.34	1780 ± 820.24	1.26
	18	3	3	100.0	539 ± 39.31	1927 ± 375.41	1.22
Total		54	20	37.0	371 ± 99.52	747 ± 588.80	1.17
Both	4	3	0	0.0	226 ± 8.72	127 ± 30.55	1.09
	5	25	0	0.0	272 ± 28.81	237 ± 69.98	1.15
	6	4	0	0.0	252 ± 16.81	188 ± 35.94	1.17
	7	19	3	15.8	340 ± 31.00	453 ± 141.15	1.12
	8	2	0	0.0	361 ± 18.38	530 ± 42.43	1.13
	9	6	4	66.7	375 ± 28.92	627 ± 158.83	1.17
	10	1	1	100.0	390 ± -	800 ± -	1.35
	11	1	1	100.0	402 ± -	740 ± -	1.14
	12	2	2	100.0	438 ± 5.66	1050 ± 127.28	1.25
	13	2	2	100.0	474 ± 19.80	1310 ± 155.56	1.23
	14	8	8	100.0	467 ± 35.05	1284 ± 304.53	1.24
	15	7	7	100.0	442 ± 55.59	1094 ± 408.53	1.21
	17	2	2	100.0	516 ± 93.34	1780 ± 820.24	1.26
	18	3	3	100.0	539 ± 39.31	1927 ± 375.41	1.22
Total		85	33	38.8	353 ± 91.69	636 ± 525.54	1.17

± = standard deviation
Number of fish with unknown age that were excluded = 0
Number of fish with unknown sex that were excluded = 0
Number of fish with unknown mat that were excluded = 0

Table 25. Age specific size and maturity conditions of sauger from Split Lake, 1988.

Sex	Age (Years)	Number	Maturity: Number Mature	Maturity: % Mature	Fl ± s.d. (mm)	Wt ± s.d. (g)	Mean Condition Factor
Males	2	1	0	0.0	234 ± -	136 ± -	1.06
	4	6	1	16.7	220 ± 17.76	108 ± 24.11	1.00
	5	13	3	23.1	242 ± 12.42	138 ± 21.94	0.97
	6	8	1	12.5	241 ± 11.04	139 ± 17.82	0.99
	7	11	4	36.4	261 ± 15.05	163 ± 32.44	0.91
	8	4	3	75.0	279 ± 9.36	227 ± 17.31	1.04
	9	4	4	100.0	289 ± 12.15	235 ± 45.60	0.97
	10	2	2	100.0	277 ± 2.12	206 ± 2.83	0.97
	11	5	4	80.0	292 ± 10.81	253 ± 21.56	1.02
	12	5	5	100.0	323 ± 20.62	354 ± 97.74	1.03
	14	2	2	100.0	317 ± 4.24	354 ± 44.55	1.11
	15	2	2	100.0	322 ± 19.80	343 ± 60.81	1.02
	17	1	1	100.0	324 ± -	329 ± -	0.97
Total		64	32	50.0	266 ± 34.19	195 ± 86.14	0.99
Females	4	4	0	0.0	228 ± 8.64	121 ± 8.70	1.02
	5	16	3	18.8	241 ± 14.58	139 ± 25.38	0.98
	6	9	4	44.4	251 ± 16.24	165 ± 41.09	1.02
	7	16	6	37.5	268 ± 15.63	197 ± 31.56	1.02
	8	7	6	85.7	280 ± 7.03	228 ± 24.70	1.04
	9	13	11	84.6	292 ± 22.03	269 ± 67.21	1.05
	10	3	3	100.0	317 ± 26.10	356 ± 118.37	1.08
	11	7	7	100.0	296 ± 33.29	280 ± 67.16	1.07
	12	4	3	75.0	314 ± 15.61	334 ± 57.26	1.07
	13	5	5	100.0	337 ± 12.25	410 ± 81.86	1.06
	14	8	8	100.0	335 ± 21.88	409 ± 94.66	1.07
	15	4	4	100.0	349 ± 30.17	448 ± 120.50	1.05
	16	1	1	100.0	332 ± -	364 ± -	0.99
	17	2	2	100.0	344 ± 2.83	408 ± 5.66	1.00
	18	4	4	100.0	347 ± 13.99	445 ± 80.93	1.06
Total		103	67	65.0	287 ± 41.11	261 ± 119.33	1.04
Both	2	1	0	0.0	234 ± -	136 ± -	1.06
	4	10	1	10.0	223 ± 14.71	113 ± 19.69	1.01
	5	29	6	20.7	241 ± 13.42	138 ± 23.49	0.98
	6	17	5	29.4	247 ± 14.50	153 ± 34.04	1.01
	7	27	10	37.0	265 ± 15.51	183 ± 35.69	0.98
	8	11	9	81.8	280 ± 7.49	228 ± 21.37	1.04
	9	17	15	88.2	292 ± 19.86	261 ± 63.21	1.03
	10	5	5	100.0	301 ± 29.02	296 ± 117.42	1.04
	11	12	11	91.7	294 ± 25.55	269 ± 53.09	1.05
	12	9	8	88.9	319 ± 18.11	345 ± 78.21	1.05
	13	5	5	100.0	337 ± 12.25	410 ± 81.86	1.06
	14	10	10	100.0	332 ± 20.82	398 ± 87.90	1.08
	15	6	6	100.0	340 ± 28.49	413 ± 111.26	1.04
	16	1	1	100.0	332 ± -	364 ± -	0.99
	17	3	3	100.0	337 ± 11.72	382 ± 45.79	0.99
	18	4	4	100.0	347 ± 13.99	445 ± 80.93	1.06
Total		167	99	59.3	279 ± 39.85	236 ± 112.20	1.02

± = standard deviation
Number of fish with unknown age that were excluded = 0
Number of fish with unknown sex that were excluded = 0
Number of fish with unknown mat that were excluded = 0

Age specific size and maturity conditions of sauger from Stephens Lake, 1988.

Age (Years)	Number	Maturity: Number Mature	Maturity: % Mature	Fl ± s.d. (mm)	Wt ± s.d. (g)	Mean Condition Factor
3	1	0	0.0	192 ± -	74 ± -	1.05
4	16	6	37.5	205 ± 25.05	90 ± 34.73	1.01
5	77	55	71.4	235 ± 15.20	129 ± 26.86	0.98
6	19	14	73.7	241 ± 18.23	136 ± 36.33	0.95
7	16	14	87.5	264 ± 21.03	188 ± 53.26	1.00
8	3	3	100.0	305 ± 28.38	287 ± 102.63	0.99
9	1	1	100.0	320 ± -	320 ± -	0.98
10	6	5	83.3	325 ± 23.24	370 ± 95.29	1.06
11	5	5	100.0	322 ± 14.03	332 ± 30.33	0.99
12	3	3	100.0	350 ± 26.46	400 ± 72.11	0.93
13	4	4	100.0	329 ± 18.86	345 ± 61.91	0.97
14	3	3	100.0	353 ± 6.11	447 ± 61.10	1.02
15	1	1	100.0	370 ± -	440 ± -	0.87
16	1	1	100.0	374 ± -	580 ± -	1.11
17	1	1	100.0	324 ± -	320 ± -	0.94
	157	116	73.9	253 ± 43.62	174 ± 104.61	0.98
	8	0	0.0	208 ± 19.29	92 ± 25.19	1.00
5	37	1	2.7	235 ± 14.11	130 ± 29.55	1.00
6	14	6	42.9	257 ± 28.11	181 ± 66.12	1.03
7	20	9	45.0	283 ± 21.61	241 ± 55.71	1.05
8	2	1	50.0	293 ± 46.67	270 ± 127.28	1.03
9	4	3	75.0	315 ± 35.57	330 ± 102.31	1.02
10	2	2	100.0	339 ± 7.07	360 ± 0.00	0.93
11	8	7	87.5	336 ± 15.25	380 ± 47.81	1.00
12	1	1	100.0	350 ± -	400 ± -	0.93
13	2	2	100.0	371 ± 12.73	500 ± 56.57	0.98
14	8	6	75.0	376 ± 18.21	505 ± 67.40	0.95
15	1	1	100.0	374 ± -	560 ± -	1.07
16	1	1	100.0	372 ± -	560 ± -	1.09
17	1	1	100.0	360 ± -	380 ± -	0.81
18	3	3	100.0	377 ± 5.77	480 ± 20.00	0.90
19	1	1	100.0	352 ± -	460 ± -	1.05
21	1	1	100.0	352 ± -	420 ± -	0.96
Total	114	46	40.4	279 ± 56.31	244 ± 143.85	1.00
Male	1	0	0.0	192 ± -	74 ± -	1.05
4	24	6	25.0	206 ± 22.90	91 ± 31.31	1.01
5	114	56	49.1	235 ± 14.79	129 ± 27.64	0.98
6	33	20	60.6	248 ± 23.80	155 ± 54.99	0.98
7	36	23	63.9	274 ± 23.11	218 ± 60.11	1.03
8	5	4	80.0	300 ± 31.43	280 ± 96.95	1.00
9	5	4	80.0	316 ± 30.89	328 ± 88.71	1.01
10	8	7	87.5	329 ± 20.81	368 ± 80.67	1.02
11	13	12	92.3	331 ± 15.82	362 ± 47.23	1.00
12	4	4	100.0	350 ± 21.60	400 ± 58.88	0.93
13	6	6	100.0	343 ± 26.97	397 ± 96.68	0.97
14	11	9	81.8	370 ± 18.93	489 ± 68.33	0.97
15	2	2	100.0	372 ± 2.83	500 ± 84.85	0.97
17	2	2	100.0	373 ± 1.41	570 ± 14.14	1.10
17	2	2	100.0	342 ± 25.46	350 ± 42.43	0.88
18	3	3	100.0	377 ± 5.77	480 ± 20.00	0.90
19	1	1	100.0	352 ± -	460 ± -	1.05
21	1	1	100.0	352 ± -	420 ± -	0.96
Total	271	162	59.8	264 ± 50.99	203 ± 127.15	0.99

± = standard deviation

Number of fish with unknown age that were excluded = 1

Number of fish with unknown sex that were excluded = 0

Number of fish with unknown mat that were excluded = 0

Table 27. Age specific size and maturity conditions of northern pike from Split Lake, 1988.

Sex	Age (Years)	Number	Maturity: Number Mature	Maturity: % Mature	Fl ± s.d. (mm)	Wt ± s.d. (g)	Mean Condition Factor
	1	3	0	0.0	217 ± 4.16	76 ± 3.46	0.74
Males	2	2	1	50.0	455 ± 207.89	812 ± 831.56	0.70
	4	6	5	83.3	443 ± 62.99	657 ± 275.73	0.72
	5	5	4	80.0	478 ± 37.31	760 ± 158.11	0.69
	6	4	4	100.0	549 ± 49.33	1403 ± 468.93	0.88
	7	5	5	100.0	609 ± 33.54	1520 ± 246.98	0.67
	8	4	4	100.0	662 ± 41.18	2135 ± 490.27	0.73
	9	2	2	100.0	548 ± 260.22	1869 ± 2052.02	0.86
Total		31	25	80.6	503 ± 141.06	1132 ± 790.80	0.74
Females	2	2	0	0.0	317 ± 46.67	242 ± 108.19	0.73
	3	2	0	0.0	421 ± 4.24	560 ± 56.57	0.75
	4	2	1	50.0	447 ± 4.24	649 ± 12.73	0.73
	5	6	5	83.3	546 ± 41.79	1203 ± 312.71	0.73
	6	5	4	80.0	547 ± 32.30	1102 ± 131.42	0.68
	7	8	6	75.0	580 ± 67.78	1619 ± 553.47	0.85
	8	2	1	50.0	635 ± 35.36	1995 ± 530.33	0.77
	9	1	1	100.0	680 ± -	2420 ± -	0.77
	10	1	1	100.0	760 ± -	4020 ± -	0.92
	11	1	1	100.0	726 ± -	2700 ± -	0.71
Total		30	20	66.7	549 ± 105.90	1390 ± 821.71	0.76
	1	3	0	0.0	217 ± 4.16	76 ± 3.46	0.74
Both	2	4	1	25.0	386 ± 146.56	527 ± 585.57	0.72
	3	2	0	0.0	421 ± 4.24	560 ± 56.57	0.75
	4	8	6	75.0	444 ± 53.29	655 ± 233.11	0.72
	5	11	9	81.8	515 ± 51.76	1002 ± 335.40	0.71
	6	9	8	88.9	548 ± 37.88	1236 ± 340.85	0.77
	7	13	11	84.6	591 ± 57.18	1581 ± 448.91	0.78
	8	6	5	83.3	653 ± 38.24	2088 ± 453.54	0.74
	9	3	3	100.0	592 ± 199.16	2053 ± 1485.46	0.83
	10	1	1	100.0	760 ± -	4020 ± -	0.92
	11	1	1	100.0	726 ± -	2700 ± -	0.71
Total		61	45	73.8	525 ± 126.07	1259 ± 809.96	0.75

± = standard deviation
Number of fish with unknown age that were excluded = 0
Number of fish with unknown sex that were excluded = 0
Number of fish with unknown mat that were excluded = 0

Table 28. Age specific size and maturity conditions of northern pike from Stephens Lake, 1988.

Sex	Age (Years)	Number	Maturity: Number Mature	Maturity: % Mature	Fl ± s.d. (mm)	Wt ± s.d. (g)	Mean Condition Factor
Males	2	1	1	100.0	320 ± -	260 ± -	0.79
	3	3	3	100.0	399 ± 38.80	447 ± 167.73	0.68
	4	6	6	100.0	430 ± 19.90	533 ± 68.90	0.67
	5	5	5	100.0	460 ± 21.00	648 ± 100.60	0.66
	6	4	4	100.0	494 ± 26.45	800 ± 182.57	0.66
	8	2	2	100.0	722 ± 36.77	2000 ± 141.42	0.53
Total		21	21	100.0	467 ± 96.69	726 ± 458.96	0.66
Females	2	1	0	0.0	268 ± -	120 ± -	0.62
	3	5	1	20.0	365 ± 82.25	400 ± 111.36	0.99
	4	5	2	40.0	464 ± 56.70	688 ± 289.34	0.66
	5	5	2	40.0	500 ± 41.65	848 ± 268.92	0.66
	6	1	1	100.0	550 ± -	1100 ± -	0.66
	7	3	1	33.3	536 ± 64.47	1307 ± 90.18	0.89
	8	2	2	100.0	649 ± 55.15	2260 ± 735.39	0.81
	9	1	1	100.0	644 ± -	1840 ± -	0.69
	10	1	1	100.0	744 ± -	3180 ± -	0.77
	12	2	2	100.0	838 ± 147.08	4230 ± 1909.19	0.70
	13	1	1	100.0	1000 ± -	7700 ± -	0.77
Total		27	14	51.9	535 ± 176.40	1501 ± 1709.29	0.77
Both	2	2	1	50.0	294 ± 36.77	190 ± 98.99	0.71
	3	8	4	50.0	378 ± 67.94	418 ± 125.33	0.88
	4	11	8	72.7	445 ± 42.40	604 ± 205.88	0.67
	5	10	7	70.0	480 ± 37.57	748 ± 218.52	0.66
	6	5	5	100.0	505 ± 34.11	860 ± 207.36	0.66
	7	3	1	33.3	536 ± 64.47	1307 ± 90.18	0.89
	8	4	4	100.0	686 ± 56.93	2130 ± 457.68	0.67
	9	1	1	100.0	644 ± -	1840 ± -	0.69
	10	1	1	100.0	744 ± -	3180 ± -	0.77
	12	2	2	100.0	838 ± 147.08	4230 ± 1909.19	0.70
	13	1	1	100.0	1000 ± -	7700 ± -	0.77
Total		48	35	72.9	505 ± 149.41	1162 ± 1362.66	0.72

± = standard deviation

Number of fish with unknown age that were excluded = 0

Number of fish with unknown sex that were excluded = 0

Number of fish with unknown mat that were excluded = 0

Table 29. Length-weight curves for fish captured in Split and Stephens lakes, 1988.

Species	Lake	$\log_e W = a+b * \log_e L$	r
Whitefish	Split	$\log_e Y = -12.367 + 3.231 \log_e X$	0.998
	Stephens	$\log_e Y = -12.589 + 3.265 \log_e X$	0.991
Walleye	Split	$\log_e Y = -12.333 + 3.170 \log_e X$	0.993
	Stephens	$\log_e Y = -11.974 + 3.105 \log_e X$	0.994
Sauger	Split	$\log_e Y = -12.299 + 3.142 \log_e X$	0.982
	Stephens	$\log_e Y = -11.428 + 2.982 \log_e X$	0.984
Northern pike	Split	$\log_e Y = -11.620 + 2.968 \log_e X$	0.978
	Stephens	$\log_e Y = -10.469 + 2.773 \log_e X$	0.962
Cisco	Split	$\log_e Y = -11.961 + 3.159 \log_e X$	0.985
	Stephens	$\log_e Y = -11.172 + 3.012 \log_e X$	0.974
White sucker	Split	$\log_e Y = -11.893 + 3.144 \log_e X$	0.976
	Stephens	$\log_e Y = -11.336 + 3.047 \log_e X$	0.925
Longnose sucker	Split	$\log_e Y = -11.357 + 3.036 \log_e X$	0.996
	Stephens	$\log_e Y = -10.918 + 2.957 \log_e X$	0.976
Mooneye	Split	$\log_e Y = -11.137 + 2.997 \log_e X$	0.981
	Stephens	$\log_e Y = -14.451 + 3.599 \log_e X$	0.962
Lake chub	Split	$\log_e Y = - 9.042 + 2.569 \log_e X$	0.939
	Stephens	$\log_e Y = - 9.769 + 2.715 \log_e X$	0.905

Table 30. Maturity rate equations for whitefish, walleye, sauger and northern pike from Split and Stephens lakes, 1988.

Species	Lake	Sex	Regression *	r^{+}	Age at 50% mature (yrs)
Whitefish	Split	males	Y = 4.674 - 0.954 X	0.996	4.9
	Stephens		Y = 3.509 - 0.604 X	0.617+	5.8
	Split	females	Y = 3.026 - 0.516 X	0.935+	5.9
	Stephens		Y = 4.809 - 0.790 X	0.975	6.1
	Split	both	Y = 4.409 - 0.766 X	0.903+	5.8
	Stephens		Y = 6.311 - 1.010 X	0.949	6.2
Walleye	Split	males	Y = 9.091 - 1.252 X	0.953+	7.3
	Stephens		indeterminant data points		
	Split	females	Y = 2.446 - 0.231 X	0.871	10.6
	Stephens		indeterminant data points		
	Split	both	Y = 3.196 - 0.394 X	0.749+	8.1
	Stephens		indeterminant data points		
Sauger	Split	males	Y = 4.477 - 0.606 X	0.797+	7.4
	Stephens		Y = 3.272 - 0.749 X	0.952	4.4
	Split	females	Y = 5.585 - 0.835 X	0.921	6.7
	Stephens		Y = 7.351 - 0.965 X	0.866	7.6
	Split	both	Y = 5.797 - 0.855 X	0.968	6.8
	Stephens		Y = 2.569 - 0.460 X	0.980	5.6
Northern pike	Split	males	Y = 0.875 - 0.551 X	0.896+	1.7
	Stephens		indeterminant data points		
	Split	females	Y = 0.668 - 0.308 X	0.557+	2.2
	Stephens		Y = 2.694 - 0.490 X	0.866+	5.5
	Split	both	Y = 0.894 - 0.491 X	0.995	1.8
	Stephens		Y = 0.776 - 0.352 X	0.858	2.2

* $Y = \log \frac{(100-Yi)}{Yi}$ where Yi = frequency of mature fish in age class i,

X = age (yrs)

+ = non-significant at $P \geq 0.05$

Table 31. Mortality rate equations for whitefish, walleye, sauger, northern pike and cisco (Split only) from Split and Stephens lakes, 1988.

Species	Lake	Instantaneous mortality (Z)	Annual mortality (A)	Annual survival (S)	r	Age classes
Whitefish	Split	0.453	0.364	0.636	0.890	10–14, 16
	Stephens	0.770	0.537	0.463	0.924	11–14
Walleye	Split	0.464	0.371	0.629	0.945^{+}_{+}	15, 19, 21
	Stephens	0.478	0.379	0.620	0.971	14, 15, 17
Sauger	Split	0.438	0.354	0.645	0.981_{+}	11–13
	Stephens	0.523	0.407	0.593	0.775	14–17
Northern pike	Split	0.656	0.481	0.519	0.948	8–11
	Stephens	0.456	0.366	0.634	0.967	4–7
Cisco	Split	0.298	0.258	0.742	0.872^{+}	10, 11, 14, 17

+ = non significant at $P \geq 0.05$

Table 32. Walford curves for whitefish, walleye, sauger, northern pike and cisco (Split only) from Split and Stephens lakes, 1988.

Species	Lake	Walford curve $l_{t+1} = a+b * L$	L_∞ (mm)	Age classes used	r	Mean square error
Whitefish	Split	Y = 87.987 + 0.823 X	498	1-12	0.978	370.627
	Stephens	Y = 86.218 + 0.834 X	519	2-14	0.963	530.127
Walleye	Split	Y = 113.394 + 0.737 X	430	2-10	0.957	275.196
	Stephens	Y = 140.652 + 0.702 X	472	6-13	0.898	490.024
Sauger	Split	Y = 32.792 + 0.923 X	427	4-10	0.983	25.109
	Stephens	Y = 51.859 + 0.879 X	429	4-12	0.986	56.112
Northern pike	Split	Y = 132.188 + 0.864 X	969	1-10	0.934	2384.914
	Stephens	indeterminant data points				
Cisco	Split	Y = 50.851 + 0.901 X	515	2-6	0.998	8.439

Table 33. Relationship of Log_e ($L\infty - l_t$) and t (yrs) for whitefish, walleye, sauger, northern pike and cisco (Split only) from Split and Stephens lakes, 1988.

Species	Lake	Log_e ($L\infty - l_t$) = a-b*t	Age classes used	r	Mean square error
Whitefish	Split	log_e (498 - l_t) = 6.081 - 0.195 t	1-12	0.992	0.009
	Stephens	log_e (519 - l_t) = 6.261 - 0.176 t	2-14	0.941	0.066
Walleye	Split	log_e (430 - l_t) = 6.358 - 0.291 t	2-10	0.921	0.127
	Stephens	log_e (472 - l_t) = 6.840 - 0.256 t	6-12	0.957	0.034
Sauger	Split	log_e (427 - l_t) = 5.652 - 0.082 t	4-10	0.996	0.0004
	Stephens	log_e (429 - l_t) = 5.923 - 0.128 t	4-12	0.994	0.002
Northern pike	Split	log_e (969 - l_t) = 6.727 - 0.126 t	1-10	0.979	0.006
	Stephens	indeterminant data points			
Cisco	Split	log_e (515 - l_t) = 6.101 - 0.103 t	2-6	0.999	0

Table 34. Power curves for whitefish, walleye, sauger, cisco (Split only) and northern pike from Split and Stephens lakes, 1988.

Species	Lake	Power curve $Y = a * X \uparrow b$	Age classes used	r	Mean square error
Whitefish	Split	$Y = 145.951 * X \uparrow 0.468$	1-14, 16	0.979	0.006
	Stephens	$Y = 129.177 * X \uparrow 0.497$	2-18	0.966	0.008
Walleye	Split	$Y = 155.517 * X \uparrow 0.374$	2-15, 19, 21	0.939	0.008
	Stephens	$Y = 106.030 * X \uparrow 0.562$	4-18	0.976	0.004
Sauger	Split	$Y = 175.095 * X \uparrow 0.232$	2-18	0.937	0.003
	Stephens	$Y = 135.360 * X \uparrow 0.356$	3-19, 21	0.955	0.004
Northern pike	Split	$Y = 241.624 * X \uparrow 0.465$	1-11	0.976	0.007
	Stephens	$Y = 187.747 * X \uparrow 0.599$	2-10, 12, 13	0.979	0.006
Cisco	Split	$Y - 116.884 * X \uparrow 0.442$	2-11, 14, 17	0.990	0.002

Appendix 1. List of Manitoba Department of Natural Resources Fisheries Branch reports written to date on data collected from the Churchill-Nelson River Diversion under the Northern Flood Agreement Claim numbers 12 and 18. Documents are listed in chronological order of publication.

Year	Title
1984	Patalas, J.W. 1984. Fish population data from Sipiwesk, Split and Stephens lakes, 1983. Man. Dept. Nat. Res. Fish. Br. MS Report No. 84-24, 66pp.
	_____1984. Fish population data from Notigi, Wapisu, Threepoint and Footprint lakes, 1983. Man. Dept. Nat. Res. Fish. Br. MS Report No. 84-25, 70pp.
1986	Derksen, A.J. 1986. Ecological Monitoring - Fisheries 1985 Progress Report. Man. Dept. Nat. Res. Fish. Br. April 9, 1986. 43.pp.
	Kirton, J.A.W. 1986. Fish population data from Rat, Karsakuwigamak, and West West and Central Mynarski lakes, 1984. Man. Dept. Nat. Res. Fish. Br. MS Report No. 86-03, 48pp.
	_____1986. Fish population data from Split and Stephens lakes, 1984. Man. Dept. Nat. Res. Fish. Br. MS Report No. 86-04, 61pp.
	Green, D.J. 1986. Summary of Fish mercury data collected from lakes on the Rat-Burntwood and Nelson River systems, 1983-1985. Man. Dept. Nat. Res. MS Report No. 86-06, 359 pp.
	Mohr, L.C. and J.A.W. Kirton. 1986. Fish population data from Sipiwesk and Cross lakes, 1985. Man. Dept. Nat. Res. Fish. Br. MS Report No. 86-28, 83pp.
1987	Sopuck, R. D. 1987. A study of lake sturgeon (Acipenser fulvescens) in the Sipiwesk Lake area of the Nelson River, Manitoba, 1976-1978. Man. Dept. Nat. Res., Fish. Br. MS Report No. 87-2, 59pp.
	Hagenson, I. 1987. Fish population data from Rat and Split lakes, 1985. Man. Dept. Nat. Res. Fish. Br. MS Report No. 87-04, 59pp.
	Kirton, J.A.W. 1987. Fish population data from Macheewin, Osik, Footprint and Threepoint lakes, 1984. Man. Dept. Nat. Res. Fish. Br. MS Report No. 87-06, 78pp.

Appendix 1, continued.

Year	Title
1987	Green, D.J. 1987. Summary of fish population data from Rat and Threepoint lakes, 1986. Man. Dept. Nat. Res. Fish. Br. MS. Report No. 87-07, 47pp.
	Kirton, J.A.W. and L.C. Mohr. 1987. Fish population data from Wuskwatim and Apussigamasi lakes, 1984. Man. Dept. Nat. Res. Fish. Br. MS Report No. 87-08, 44pp.
	Sopuck, R.D. 1987. An analysis of changes in the Pipestone Lake fish community from 1980 to 1986. Man. Dept. Nat. Res., Fish. Br. MS Report No. 87-11, 59pp & Appendices.
	Livingston, L. 1987. A checklist of phytoplankton genera for Nelson River and Rat-Burntwood lakes, 1980, 1981 and 1986. Man. Dept. Nat. Res. Fish. Br. MS Report No. 87-14, 20pp.
	Hagenson, I. 1987. Fish population data from Split and Stephens lakes, 1986. Man. Dept. Nat. Res. Fish. Br. MS Report No. 87-26, 59pp.
	Green, D.J. 1987. Summary of fish population data collected from eight lakes on the Rat-Burntwood River System, 1985. Man. Dept. Nat. Res. Fish. Br. MS Report No. 87-27, 130pp.
	Mohr, L. 1987. Fish population data from Sipiwesk and Cross lakes, 1986. Man. Dept. Nat. Res. Fish. Br. MS Report No. 87-28, 87pp.
	Anonymous. 1987. A manual for ecological monitoring - data collection procedures. Man. Dept. Nat. Res. Fish. Br. June, 1987.
	Mohr, L. and Livingston, L. 1987. Ecological monitoring zooplankton analysis methodology for 1986/87. Man. Dept. Nat. Res. Fish. Br. June, 1987.
	Derksen, A.J. and D.J. Green. Total mercury concentrations in large fishes from lakes on the Churchill River Diversion and Nelson River. Canada-Manitoba Agreement on the Study and Monitoring of Mercury in Churchill River Diversion. Tech. Appendices to Summary Report Volume 4, paper no. 17.

Appendix 1, continued.

Year	Title
1988	Derksen, A.J. et.al. 1988. Ecological Monitoring - Fisheries 1986 Progress Report. Man. Dept. Nat. Res. Fish. Br. March, 1988.
	Livingston, L. 1988. Summary of phytoplankton data for the Nelson River and Rat-Burntwood lakes, 1987. Man. Dept. Nat. Res. Fish. Br. MS Report No. 88-04, 164pp.
	Green, D.J. 1988. Summary of fish population data from Rat and Threepoint lakes, 1987. Man. Dept. Nat. Res. Fish. Br. MS. Report No. 88-11, 55pp.
	_____, 1988. Summary of fish population data from Sipiwesk and Cross lakes, 1987. Man. Dept. Nat. Res. Fish. Br. MS Report No. 88-12, 90pp.
	Patalas, J.W. 1988. The effects of commercial fishing on lake sturgeon (Acipenser fulvescens) populations in the Sipiwesk Lake area of the Nelson River, Manitoba, 1987-1988. Man. Dept. Nat. Res. Fish. Br. MS Report No. 88-14, 38pp.
	Hagenson, I. 1988. Fish population data from Split and Stephens lakes, 1987. Man. Dept. Nat. Res. Fish. Br. MS Report No. 88-15, 66pp.
1989	Green, D.J. 1989. Summary of fish population data from Sipiwesk and Cross lakes, 1988. Man. Dept. Nat. Res. Fish. Br. MS. Report No. 89-11, 91pp.
	Livingston, L.R. 1989. Summary of phytoplankton data for the Nelson River and Rat-Burntwood lakes, 1988. Man. Dept. Nat. Res. Fish. Br. MS Report No. 89-07, 81pp.
	Green, D.J, 1989. Summary of fish population data from Rat and Threepoint lakes, 1988. Man. Dept. Nat. Res. Fish. Br. MS Report No. 89-13, 69pp.
	Cherepak, B. C. 1989. The post-flood morphometry and bathymetry of Rat and Threepoint lakes, 1988. Man. Dept. Nat. Res. Fish. Br. MS Report No. 89-14.

Appendix 1, continued.

Year	Title
1989	Ramsey, D. J. et al. 1989. Evolution of limnological conditions in lakes of the Nelson and Rat-Burntwood river systems after Churchill River diversion and Lake Winnipeg regulation: I. An Overview. Man. Dept. Nat. Res. Fish. Br. MS Report No. 89-15.
	Hagenson, I. 1989. Fish population data from Split and Stephens lakes, 1988. Man. Dept. Nat. Res. Fish. Br. MS Report No. 89-16.